Contract No.: EP-W-09-002
WA #: 075-RDRD-02YP

Region 2 RAC2
Remedial Action Contract

Health and Safety Plan

San German Groundwater
Contamination Site,
Pre-Design Investigation

Remedial Design

San German, Puerto Rico

September 17, 2018

CDM Smith

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September 17, 2018

Dr. Adalberto Bosque
Remedial Project Manager
U.S. Environmental Protection Agency
USEPA Region 2 - Caribbean Environmental
Protection Division, City View Plaza II
#48 Rd 165, km 1.2, STE 7000
Guaynabo, Puerto Rico 00968-8069

PROJECT: EPA Region 2 RAC 2 Contract No.: EP-W-09-002
Work Assignment: 075-RDRD-02YP

DOCUMENT NO.: 3323-075-03632

SUBJECT: Health and Safety Plan
San German Groundwater Contamination Site
Pre-Design Investigation
San German, Puerto Rico

Dear Dr. Bosque:

CDM Smith Federal Programs Corporation (CDM Smith) is pleased to submit the Health and Safety Plan for the San German Groundwater Contamination Site, Pre-Design Investigation, located in San German, Puerto Rico.

If you have any questions regarding this submittal, please contact me at (212) 377-4527.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

Brendan MacDonald, P.E.
Site Manager

PSO:

cc: H. Eng, EPA Region 2 (Letter Only)
J. Litwin, CDM Smith (letter Only)
Field Team, CDM Smith
D. Wintle, CDM Smith (electronic copy)
T. Bennett, CDM Smith (electronic copy)
RAC2 Region 2 Document Control

SAN GERMAN GROUNDWATER CONTAMINATION SITE
PRE-DESIGN INVESTIGATION
SAN GERMAN, PUERTO RICO
HEALTH AND SAFETY PLAN

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FIGURES

APPENDICES

The CDM Smith Health and Safety Manual (January 2012) will be kept on-site. It covers all the required Health and Safety Plan elements not detailed in this Health and Safety Plan Form.

ACRONYMS

AHA	Activity Hazard Analysis
bgs	below ground surface
ca	carcinogen
CDM Smith	CDM Federal Programs Corporation
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CNS	central nervous system
COR	corporate
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
DCE	dichloroethylene
EPA	(United States) Environmental Protection Agency
eV	electron volt
EZ	exclusion zone
FTL	field team leader
FS	feasibility study
FSU	Federal Services Unit
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
H&S	health and safety
HEPA	high efficiency particulate air
HSM	Corporate Health and Safety Manager
IDLH	immediately dangerous to life or health
IDW	investigation derived waste
km	kilometer
LEL	lower explosive limit
MCL	maximum contaminant level
mg/m^3	milligram/cubic meter
mR/hr	milliroentgen per hour
SDS	safety data sheet
O_2	oxygen
OSHA	Occupational Health and Safety Act
OU	operable unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PDI	Pre-Design Investigation
PEL	Permissible Exposure Limit
PID	photoionization detector
ppb	part per billion
PPE	personal protective equipment
ppm	part per million
PR	Puerto Rico
PRASA	Puerto Rico Aqueduct and Sewer Authority
PRDOH	Puerto Rico Department of Health
RD	Remedial Design
REZ	radiation exclusion zone
RI	Remedial Investigation
ROD	Record of Decision

RPM	Remedial Project Manager
RSCC	Regional Sample Control Coordinator
SHSO	Site Health & Safety Officer
SHSC	Site Health & Safety Coordinator
SMO	Sample Management Office
Std	standard
SVE	soil vapor extraction
SZ	support zone
TBD	to be determined
TCE	trichloroethylene
TLV	Threshold Limit Value
TSU	Technical Service Unit
µg/kg	microgram per kilogram
VOC	volatile organic compound

Using this Health and Safety Plan

- CDM Smith and this project's Owner require that this scope of work not result in:
    - Injuries to employees of CDM Smith, or other persons.
    - Employee exposures to health or injury hazards
    - Significant increases in contaminant levels in air, soil, water, or sediment near the site.
    - Violations of OSHA, MSHA, EPA, NRC, or State regulations.

- Each of you who read this plan have a responsibility to
    - Understand and follow its requirements.
    - Help other project personnel understand and follow its requirements
        - Let someone know if any team member doesn't understand all of it (for example, those who can't read the language in which the plan is written)
    - Inform other on-site persons (no matter what their affiliation) about conditions that could harm them
    - Inform your project manager, team leader, or health and safety manager about any training, materials, or equipment that would help you work more safely
    - Use the CDM Smith Safe-Think process to prevent injury during this project

- General Rules
    - No person should perform any work that places his or her safety, or that of others, at risk
    - Quickly notify your Site Health and Safety Officer, Project/Site Manager, or Health and Safety Manager about any unsafe act or condition
    - Any person on-site may stop work for unsafe conditions or unsafe actions

Safe - Think Process

Our **Safe - Think process** is a tool that is used in many safety management systems and is conducted by individual employees. The process is simply a mental exercise—involving no forms, plans, complex written procedures or programs—and it is something every employee can and should do.

Stop and think about the task at hand. Some questions to ask include:

- What am I going to do?
- What steps or actions am I going to perform?
- How could I or someone else get hurt?
- Do I have the right equipment?
- What else is going on around me?
- Do I understand how to do this task safely?
- Do I need help?

Here are some questions to ask yourself when assessing everyday work situations.

When working at a desk:

- Are my desk, chair, and workstation set up properly?
- Am I comfortable?
- Should I ask for help to assess my workstation?
- Do I take sufficient breaks or change tasks to allow appropriate rest and recovery periods?

Before carrying and/or lifting something:

- Where am I going to put it down?
- Is the travel path between where I pick it up and put it down clear and trip/slip free?
- How big/heavy is it?
- Is it easy or hard to hold onto?
- Am I wearing the right footwear to safely lift an object?
- Do I need help?
- Are there tools available to help (hand trucks, dollies, etc.)?

If, after asking yourself these questions, you believe you can do the work safely, then proceed and accomplish the task. On the other hand, if you conclude that you are not sure you can do the work safely, don't have the right equipment, or think you need help, then you should stop and take steps to correct the issue. Help is available from your direct manager, H&S coordinator, or H&S manager.

This process empowers you to identify hazards associated with your work and to take actions to make it safe. We should all perform these personal hazard assessments on an ongoing basis, at the beginning of the day, when we change tasks or do something new, or when conditions change.

First Aid/Medical Advisory Services – CDM Smith has partnered with AllOne Health to provide 24/7 first aid and medical advice services to U.S. based employees. This means that employees have a reliable, round-the-clock resource staffed by qualified nurses and doctors who can provide guidance about first aid and medical treatment for non-emergency work related injuries or illnesses.

For medical emergencies, continue to call local emergency services directly via 911! H&S management should be notified as soon as practicable.

If an occupational injury occurs, call the toll-free AllOne Health number, (**1.800.350.4511, and PRESS 1**) and you will be transferred to a medical professional.

Be prepared to provide:

- ***Name/contact information***
- ***Location***
- ***Supervisor/manager information***
- ***Whether you are with CDM Constructors or another CDM Smith unit***
- ***Description of the injury and any relevant existing medical conditions***

The nurse will then recommend:

- **First Aid:** The employee will be provided self-care instructions or first aid treatments to be performed.
- **Non-Emergency Medical Care:** If warranted, the nurse will recommend and identify the nearest qualified clinic where the injured employee should be taken, communicating with and advising clinic staff of the situation.
- **Emergency Care:** *Please note that for medical emergencies, you should continue to call 911 first, notifying AllOne Health and H&S management as soon as it is practical to do so.*

For CCI projects and others with pre-arranged medical services, project-specific procedures may supersede those listed here. CCI personnel may still require Drug and Alcohol Testing.

1. ***Follow AllOne Health instructions (e.g., first aid, go to clinic, etc.).***
2. ***Complete and submit the standard CDM Smith*** Injury/Illness Report ***form.***
3. ***After your care, follow-up with AllOne at the 1-800 # to discuss your treatment and any questions you may have.***

Employee well-being continues to be our highest concern. It is our belief that these new services will enhance the quality and timeliness of first aid and medical care for non-emergency work related injuries or illnesses. If you have any questions regarding this program contact your H&S Manager.

HEALTH AND SAFETY PLAN FORM
CDM Smith Health and Safety Program

This document is for the exclusive use of CDM Smith and its subcontractors

CDM Smith
Project Document 3323-075-03632

PROJECT NAME	San German Groundwater Contamination Site	**PROJECT#**	EP-W-09-002	**REGION**	2
SITE ADDRESS	San German, Puerto Rico	**CLIENT ORGANIZATION**			EPA
		CLIENT CONTACT			Dr. Aldalberto Bosque
		CLIENT CONTACT PHONE #			(787) 977-5825

( ) AMENDMENT TO EXISTING APPROVED HASP? NA

( ) HASP AMENDMENT NUMBER? NA ( ) DATE OF PREVIOUS HASP APPROVAL NA

OBJECTIVES OF FIELD WORK:
(e.g. collect surface soil samples):

The remedial design (RD) for the site will include a Pre-Design Investigation (PDI). Field activities for the PDI will involve the following tasks:
1. Site Reconnaisance
2. Mobilization and demobilization
3. Hydrogeologic assessment- monitoring well installation, well development, aquifer testing , synoptic water level measurements, groundwater screening
4.Environmental sampling- soil and groundwater

SITE TYPE: *Check as many as applicable*

Active	**(x)**	Landfill	( )	Unknown	( )
Inactive	( )	Uncontrolled	( )	Military	( )
Secure	**(x)**	**Industrial**	**(x)**	Residential	( )
Unsecure	**(x)**	Recovery	( )		
Enclosed space	( )	Well Field	( )		

All requirements described in the CDM Smith Health and Safety Manual are incorporated in this health and safety plan by reference.

PERSONNEL AND RESPONSIBILITIES				
NAMES OF WORK CREW MEMBERS	**Company / Division / Office**	**Current Training & Medical?**	**Project or Site Responsibilities**	**Tasks On Site?**
Brendan MacDonald	FSU/NYC	NA	Site Manager	**1-2**
Grace Chen	TSU/EDN	Yes	Remedial Design Task Leader	**1-2**
Shawn Oliveira	TSU/Libby	NA	Health and Safety Manager	**1-2**
Tonya Bennett	TSU/NYC	Yes	Site Health and Safety Coordinator (SHSC)	**1-2**
Mike Valentino	FSU/Puerto Rico	Yes	Field Task Manager/Senior Geologist	**1-2-3-4**
Jose Reyes	FSU/Puerto Rico	Yes	Field Team Leader and Site Health & Safety Officer (SHSO)	**1-2-3-4**
TBD	Onsite	TBD	Geologist	**1-2-3-4**
TBD	TBD	TBD	Drilling Subcontractor	**1-2-3-4**

BACKGROUND REVIEW: (x) Complete ( ) Incomplete

SITE MAP:

See Figure 1

CONTAMINATION SOURCE AREA MAP:

See Figure 2

HEALTH AND SAFETY PLAN FORM CDM Smith Health and Safety Program	*This document is for the exclusive use of CDM Smith and its subcontractors*	**CDM Smith** **Project Document 3323-075-03632**

HISTORY: *Summarize conditions that relate to hazard. Include citizen complaints, spills, previous investigations or agency actions, known injuries, etc.*

Volatile organic compounds (VOC) have been detected in three public supply wells associated with the Puerto Rico Aqueduct and Sewer Authority (PRASA) San German Urbano Water System (Figure 1). Groundwater samples collected between 2001-2005 from the three wells (Retiro, Lola Rodriguez de Tio I (Lola I), and Lola Rodriguez de Tio II (Lola II)), exhibited detectable concentrations of tetrachloroethene (PCE) and cis-1,2-dichloroethene (cis-1,2 DCE). In 2006, the Puerto Rico Department of Health ordered the Retiro well closed due to PCE concentrations exceeding the federal maximum contaminant level of 5 ug/L. Around the same time, Lola I and Lola II were also taken out of service. From 2006 to 2008, industrial sites believed to be the source of contamination within the wells were investigated by the EPA, and the San German Groundwater Contamination Site was added to the National Priorities List in 2008. During the completion of the remedial investigation (RI)/feasibility study (FS) performed from 2012 to 2015, the Site was divided into two operable units (OU1 and OU2) based on geology, hydrogeology, and contamination. OU1 targets soil contamination that continues to be the main source of groundwater contamination. OU2 targets the site-wide groundwater contamination. Results of the RI/FS also determined Wallace Silversmiths de Puerto Rico, Ltd. (Wallace) and CCL Insertco de PR (CCL) as the sources of VOC contamination. At these two locations, five source areas (SA-1 to SA-5) were identified based on RI sampling results and past practices for chemical storage and usage (Figure 2).

WASTE TYPES: **(x) Liquid** **(x) Solid** ( ) Sludge ( ) Gas ( ) Unknown ( ) Other, specify:

WASTE CHARACTERISTICS: *Check as many as applicable.*

( ) Corrosive	( ) Flammable	( ) Radioactive
( ) Toxic	**(x) Volatile**	( ) Reactive
( ) Inert Gas	( ) Unknown	
(x) Other:	**PCE in groundwater**	

WORK ZONES:

The exclusion zone (EZ), which extends 50 feet around drill rig and all sampling activities, includes all active areas in which contaminants may affect personnel through exposure routes, and/or in which heavy equipment and other hazardous materials may be used. The contamination reduction/decontamination zone (CRZ) is the transition area between the EZ and the support zone (SZ). These zones will be established such that wind direction is from the SZ to the EZ and the buddy system will be in effect at all times. Zones will be designated with signs and caution tape.

HAZARDS OF CONCERN: *Check as many as applicable.*

(x) Heat Stress		**(x) Noise**
( ) Cold Stress		( ) Inorganic Chemicals
( ) Explosive/Flammable		**(x) Organic Chemicals**
( ) Oxygen Deficient		**(x) Motorized Traffic**
( ) Radiological		**(x) Heavy Machinery**
(x) Biological		**(x) Slips & Falls**
(X) Other:	**Cell phone safety**	
(x) Other:	**Hazardous waste site controls**	

FACILITY'S PAST AND PRESENT DISPOSAL METHODS AND PRACTICES:

The extent and nature of contamination is not known at this time. Therefore, previous disposal methods are unknown.

This plan incorporates CDM Smith's procedure for: *(Click on the relevant topics to download the hazard guideline. Delete irrelevant topics.)*

Traffic and Work Zone Safety	Hazardous Waste Site Decontamination	Hazardous Waste Site Controls	Ladders
Tools and Power Equipment	Working Safely Around Geoprobes	Personal Protective Equipment (PPE)	
Working Around Heavy Equipment	Working Safely Around Drill Rigs	Hearing Conservation	
Flammable and Combustible Liquids	Housekeeping	Fall Protection	
Manual Materials Handling	Cell Phone Safety	Compressed Gases	

HEALTH AND SAFETY PLAN FORM CDM Smith Health and Safety Program	*This document is for the exclusive use of CDM Smith and its subcontractors*	CDM Smith Project Document 3323-075-03632

DESCRIPTION AND FEATURES: *Include principal operations and unusual features (containers, buildings, dikes, power lines, hillslopes, rivers, etc.)*

The San German site is located in San German, in southwestern Puerto Rico. The site is defined by VOC detections in three wells (Retiro, Lola I, and Lola II) located south of Rio Guanajibo, between Routes 139 and 360. These wells are associated with PRASA's San German Urbano Water system, which totals seven wells and two surface water intakes. The Retiro well is located near the intersection of Route 122 and Rio Guanajino, north of Calle Oriente, along the east side of a narrow, unnamed dirt road that leads to the riverbank. Lola I is situated alongside Calle Oriente, near an entrace to the Lola Rodriguez de Tio public school. Lola II is located approximately 550 feet (ft) west-northwest of Retiro and south of Rio Guanajibo, along the south side of an unamed dirt road along the river. Retiro, Lola I, and Lola II acted as an independent interconnected supply system with approximately 800 service connections serving approximately 2,280 users in 2005. According to PRASA, the individual mean output for each well in 2005 were approximately 398,000 gallons per day (gpd) from Tertrio, 185,000 gpd from Lola I, and 170,000 gpd from Lola II. An approximately 8 ft x 10 ft x 11 ftx concrete bloack, slab-on-grade pump house sits alongside each well. Each well and pump house is surrounded by a locked, chain-link fence. Each pumphouse contains a control panel. The supply pump in Lola I is reportedly the only equipment below the ground surface. A surface water drainage channel runs underneath the Lola I pump house.

Results of the RI conducted in 2015 determined 2 lots (Wallace and CCL) as the sources of the VOC contamination. Of these two lots, five source areas were determined (SA-1 to SA-5). See figure 2 for a map of these locations. SA-1 was identified as the approximate area where drums were stored. A hill is located to the south-southwest. SA-2 exhibited extremely high PCE and TCE concentrations; the area inside the eastern building is where the compounds were reportedly historically used. An underground drainage pipe may be present between the two buildings. SA-3 contained the highest PCE concentrations under a paved area outside the building. Groundwater contamination is relatively limited in this area due to the presence of the pavement. SA-4 contains localized TCE and cis-1,2-DCE contamination. SA-5 consists of elevated soil TCE contamination and highly contaminated groundwater, with potential residual DNAPL in the shallow saprolite zone. An open ditch drainage is located on the northeastern side of this location.

SURROUNDING POPULATION: **(x) Residential (x) Industrial (x) Commercial** ( ) Rural ( ) Urban OTHER:

HAZARDOUS MATERIAL SUMMARY: ***Highlight or bold waste types and estimate amounts by category.***

CHEMICALS: *Amount/Units:*	**SOLIDS:** *Amount/Units:*	**SLUDGES:** *Amount/Units:*	**SOLVENTS:** *Amount/Units:*	**OILS:** *Amount/Units:*	**OTHER:** *Amount/Units:*
Acids	Flyash	Paints	Ketones	Oily Wastes	Laboratory
Pickling Liquors	Mill or Mine Tailings	Pigments	Aromatics	Gasoline	Pharmaceutical
Caustics	Asbestos	Metals Sludges	Hydrocarbons	Diesel Oil	Hospital
Pesticides	Ferrous Smelter	POTW Sludge	Alcohols	Lubricants	Radiological
Dyes or Inks	Non-Ferrous Smelter	Distillation Bottoms	Halogenated (chloro, bromo) Solvents	Polynuclear Aromatics	Municipal
Cyanides	Metals	Aluminum	Esters	PCBs	Construction
Phenols	Dioxins		Ethers	Heating Oil	Munitions
Halogens					
Other - *specify*	Other - *specify*	Other - *specify*	**Other - *Chlorinated - PCE, TCE, cis-1,2-DCE***	Other - *specify*	Other - *specify*

KNOWN CONTAMINANTS		HIGHEST OBSERVED CONCENTRATION*	PEL/TLV *ppm or mg/m3 (specify)*	IDLH *ppm or mg/m3 (specify)*	SYMPTOMS & EFFECTS OF ACUTE EXPOSURE	PHOTO IONIZATION POTENTIAL
Tetrachloroethylene		16.4 ppb	25 ppm	150 ppm (Ca)	Irritated eyes, nose, throat, flushed face & neck, dizziness	9.32 eV
Trichloroethylene		1.4 ppb	50 ppm	1,000 ppm (Ca)	Vertigo, visual disturbance, headache, drowsiness	9.45 eV
cis-1,2-Dichloroethylene		4.1 ppb	200 ppm	1,000 ppm	Irritated eyes, CNS depression	10.00 eV

mg/m3 = miligrams/cubic meter
Ca = carcinogen
CNS = central nervous system
eV= electron volt
PEL = permissible exposure limit
ppb = part per billion
ppm = part per million
TLV = threshold limit value
IDLH = immediately dangerous to life or health

HEALTH AND SAFETY PLAN FORM **CDM Smith Health and Safety Program**	*This document is for the exclusive use of CDM Smith and its subcontractors*	**CDM Smith** **Project Document 3323-075-03632**	
SPECIFIC TASK DESCRIPTIONS	**Disturbing the Waste?**	**TASK - SPECIFIC HAZARDS**	**HAZARD & SCHEDULE**
1 Site Reconnaisance	**Non-intrusive**	Noise, traffic controls, trips and falls, heat stress, heavy machinery	**Low Hazard** 2018
2 Mobilization and demobilization	**Non-intrusive**	Noise, traffic controls, trips and fall, heat stress.	**Low Hazard** 2018
3 Hydrogeologic assessment- monitoring well installation, well development, aquifer testing , synoptic water level measurements, groundwater screening	**Intrusive**	Organic chemicals, heavy machinery, noise, traffic controls, electric shock, flammable liquids, heat stress, drill rig safety	**Low Hazard** 2018
4 Environmental sampling- soil and groundwater	**Intrusive**	Organic chemicals, heavy machinery, noise, traffic controls, electric shock, flammable liquids, heat stress, drill rig safety	**Low Hazard** 2018
SPECIALIZED TRAINING REQUIRED: **All site personnel must have 40- hour HAZWOPER training and 8-hour refresher, fit test** **Site H&S officer must have supervisor HASWOPER training** **One personnel must have CPR and First Aid Training**		**SPECIAL MEDICAL SURVEILLANCE REQUIREMENTS:** **Medical monitoring for field staff are as per OSHA standards 29 CFR 1910.120 (f) and 29 CFR 1926.65 (f). All on-site staff with be cleared by the Health Resource ohysicians for respirator use. Copies of medical certificates will be kept on-site.**	
OVERALL HAZARD EVALUATION:	( ) High ( ) Medium **(x) Low** ( ) Unknown	*(Where tasks have different hazards, evaluate each.)*	
JUSTIFICATION:	Typical outdoor physical activities include low exposure to organic volatiles		
FIRE/EXPLOSION POTENTIAL:	( ) High ( ) Medium **(x) Low** ( ) Unknown		

PROTECTIVE EQUIPMENT: *Specify by task. Indicate type and/or material, as necessary. Group tasks if possible. Use copies of this sheet if needed.*

BLOCK A

TASKS: 1 - 2
LEVEL: D
(x) Primary ( ) Contingency

Respiratory: **(X) Not needed**
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other: Dust mask

Head and Eye: ( ) Not needed
(x) Safety Glasses
( ) Face Shield:
( ) Goggles:
(x) Hard Hat
( ) Other:

Boots: ( ) Not needed
(x) Steel-Toe ( ) Steel Shank
( ) Rubber ( ) Leather
( ) Overboots:

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall or
( ) Saranex Coverall
( ) Cloth Coverall:
(x) Other: work clothes

Gloves: **(X) Not needed**
( ) Undergloves:
( ) Gloves: Nitrile (when needed)
( ) Overgloves:

Other: specify below
(x) bug spray when needed
( ) Flotation Device If Over Water
( ) Hearing Protection
(x) Sun Screen

BLOCK B

TASKS: 3-4
LEVEL: D
(X) Primary ( ) Contingency

Respiratory: ( ) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
(X) Other: Dust mask (when needed)

Head and Eye: ( ) Not needed
(X) Safety Glasses
( ) Face Shield:
( ) Goggles:
(X) Hard Hat
( ) Other:

Boots: ( ) Not needed
(X) Steel-Toe ( ) Steel Shank
( ) Rubber ( ) Leather
( ) Overboots: Latex

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall or
( ) Saranex Coverall
( ) Cloth Coverall:
(x) Other: work clothes

Gloves: ( ) Not needed
( ) Undergloves:
(X) Gloves: Nitrile
( ) Overgloves:

Other: specify below
(X) Tick Spray
(X) Mosquito Repellent
(X) Hearing Protection
(X) Sun Screen

BLOCK C

TASKS: 1-2-3 - 4 - 5 -
LEVEL: D
( ) Primary (X) Contingency

Respiratory: ( ) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridg
( ) Escape M
(x) Other: ask (when nee

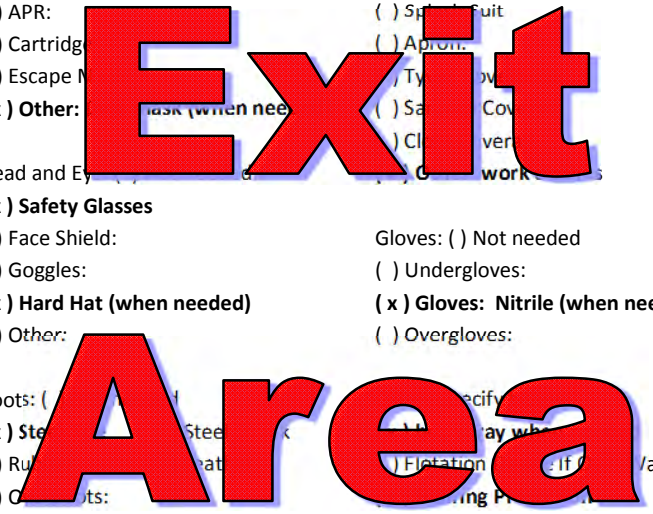
Head and Ey
(x) Safety Glasses
( ) Face Shield:
( ) Goggles:
(x) Hard Hat (when needed)
( ) Other:

Boots: (
(x) Ste Steel Shank
( ) Ru at
( ) O ts:

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Sp uit
( ) Apron:
( ) Ty ov
( ) Sa Cov
( ) Cl ver
( ) **work**

Gloves: ( ) Not needed
( ) Undergloves:
(x) Gloves: Nitrile (when needed)
( ) Overgloves:

ecify
ay wh
) Flotation If Water
ing P
(x) Sun Screen



This health and safety plan form constitutes hazard analysis per 29 CFR 1910.132

MONITORING EQUIPMENT: *Specify by task. Indicate type as necessary. Attach additional sheets if needed.*

INSTRUMENT	TASK	ACTION GUIDELINES		COMMENTS
Combustible Gas Indicator &PID (MultiRAE) 10.6 eV Lamp	**3-4**	**0-10% LEL** **10-25% LEL** **>25% LEL** **21.0% O_2** **<21.0% O_2** **<19.5% O_2**	***No explosion hazard*** ***Potential explosion hazard; notify SHSC*** ***Explosion hazard; interrupt task/evacuate*** ***Oxygen normal*** ***Oxygen deficient; notify SHSC*** ***Interrupt task/evacuate***	( ) Not Needed Monitoring will take place in breathing zone on a continuous basis during intrusive activities
		0 to 0.5 ppm: Modified Level D. **>0.5 ppm to 5ppm over a 10 minute average:.** **5ppm: Exit area and call HSM.**	**>**	
Radiation Survey Meter		>0.5 ppm to 3ppm over a >2mR/hr:	*Notify HSM* *Establish REZ*	**(x) Not Needed**
Photoionization Detector **10.6 eV Lamp** **Type OVM**	*Specify:*			**(x) Not Needed**
Flame Ionization Detector Type_____				**(x) Not Needed**
Single Gas Type_____ Type_____	*Specify:*			**(x) Not Needed**
Respirable Dust Monitor Type_____	*Specify:* **3-4** Thermo pDR 1000 data ram or equivalent	0 to 0.5 mg/m3: Level D > 0.5 mg/m3 for 10 minutes or any visible dust shutdown and improve dust control measures		( ) Not Needed Drilling Subcontractor is responsible for setting up dust control measures during drilling activities. These will include wetting the work area. CDM Smith will perform area monitoring and dust control measures for non-driller activities.
Other Type Type	*Specify:*			**(x) Not Needed**
Other Type_____ Type_____	*Specify:*			**(x) Not Needed**

DECONTAMINATION PROCEDURES

ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, & SUPPORT ZONES AS PAGE TWO

Personnel Decontamination	**Sampling Equipment Decontamination**	**Heavy Equipment Decontamination**
Summarize below or attach diagram;	*Summarize below or attach diagram;*	*Summarize below or attach diagram;*
The personal decontamination station will move from location to location based on work site. Wash hands and face if necessary with soap and water upon doffing personal protective equipment. Wash well before hand-to-mouth contact is made. Workers will remove protective clothing in the following order: -equipment drop -outer gloves -hard hat -inner gloves -face and hand wash Wash hands and face prior to ingestion of any food or liquid. ( ) Not Needed	All sampling equipment will be thoroughly decontaminated as follows: 1) Wash and scrub with low phosphate detergent 2) Potable tap water rinse 3) Air dry 4) Wrap in aluminum foil, shiny side out for transport Potable water must be from a municipal water treament supply system Water quality measurement probes must be rinsed with deionized water between uses. Water level indicator tape must be rinsed/wiped with wet paper towel between uses. ( ) Not Needed	Prior to removal from the work site, potential contaminated soil will be scraped or brushed from exterior surfaces. The drill rig and all downhole equipment such as drill rods, and any other large equipment in the extraction zone will be steam cleaned. ( ) Not Needed
Containment and Disposal Method	**Containment and Disposal Method**	**Containment and Disposal Method**
PPE wastes will be containerized in 55 gallon drums and held for appropiate disposal off-site.	Decontamination wastes will be containerized in 55 gallon drums, roll-off-containers, and water tanks and held for appropiate disposal off-site.	Decontamination wastes will be containerized in 55 gallon drums, roll-off-containers, and water tanks and held for appropiate disposal off-site.

HAZARDOUS MATERIALS TO BE BROUGHT ONSITE

Preservatives		*Decontamination*		*Calibration*	
(X) Hydrochloric Acid	( ) Zinc Acetate	**(X) Alconox ™**	( ) Hexane	**(X) 100 ppm isobutylene**	**(X) Carbon Monoxide**
( ) Nitric Acid	( ) Ascorbic Acid	( ) Liquinox ™	**(X) Isopropanol**	**(X) Methane**	**(X) pH Standards (pH 4, 7, 10)**
( ) Sulfuric Acid	( ) Acetic Acid	( ) Acetone	( ) Nitric Acid	( ) Pentane	**(X) Conductivity Std**
( ) Sodium Hydroxide	( ) Other:	( ) Methanol	( ) Other:	( ) Hydrogen	**(X) Turbidity Standard**
		( ) Mineral Spirits		( ) Propane	**(X) Hydrogen Sulfide**

HEALTH AND SAFETY PLAN FORM	*This document is for the exclusive use*	CDM Smith
CDM Smith Health and Safety Program	*of CDM Smith and its subcontractors*	Project Document 3323-075-03632

EMERGENCY CONTACTS

Water Supply	TBD
Site Telephone	TBD
EPA Release Report #:	800 / 424 - 8802
CDM Smith 24-Hour Emergency #:	FSG 571 / 216 - 7004
Facility Management	TBD
Other (specify)	
CHEMTREC Emergency #:	800 / 424 - 9300
24 Hr. First Aid/Non-Emergency Medical Services	**1-800-350-4511, Press 1**

EMERGENCY CONTACTS	NAME	PHONE
Health and Safety Manager	Shawn Oliveira	406-441-1449
Project Manager	Brendan MacDonald	917-209-4907
Site Safety Officer	Jose Reyes	787-406-3331
Health and Safety Coordinator	Tonya Bennett	917-903-5394
Client Contact	Adalberto Bosque	787-977-5825
Other *(specify)*		
State Spill Number	Puerto Rico	(787) 724-0124
Fire Department		911
Police Department		911
State Police		911
Health Department		
Poison Control Center	Nationwide	800-222-1222
Occupational Physician	Dr. Fred Kohanna	800-350-4511

For non-emergency medical services:
1. Call AllOne Health at 1.800.350.4511, PRESS 1, and tell them you are reporting an injury for CDM Smith. Supply requested information.
2. Follow AllOne Health instructions (e.g., first aid, go to clinic, etc.).
3. After care, follow-up with AllOne at the 1-800 #.

Evacuate the site and meet at a predetermined location if any unexpected hazardous conditions are encountered. All teams will be in communication with one another via cell phones. If staff observe hazards for which they have not been prepared, they will withdraw from the area and call the CDM Smith Health and Safety Manager, Shawn Oliveira. Solo CDM Smith representatives will not enter or remain in an area unless accompanied by client or facility personnel. Without regard to monitoring instrument reading, CDM Smith personnel will leave the site and upgrade their level of protection if they experience nausea or dizziness. The buddy system will also be in effect at all times.

MEDICAL EMERGENCY **PHONE**

Hospital Name:	Hospital de la Concepción	(787) 834-0101
Hospital Address	CARR 2 KM 173, San German, Puerto Rico, 00683	
Name of Contact at Hospital:		
Name of 24-Hour Ambulance:		
Route to Hospital:		

1. Head northwest on Calle B toward Calle A
2. Turn right on Calle A
2. Turn left onto Route 102
3. Turn right onto Route 122
4. Merge onto Carr Puerto Rico 2 and exit on the right
5. Hospital will be on the right

HEALTH AND SAFETY PLAN APPROVALS (H&S Mgr must sign each plan)

HSC Coordinator	Tonya Bennett	Date	9/17/2018
HSM Signature		Date	9/17/2018

Distance to Hospital: 4.0 km Estimated Time: 7 min

ROUTE TO HOSPITAL MAP:

HEALTH AND SAFETY PLAN SIGNATURE FORM

All site personnel must sign this form indicating receipt of the HASP. Keep this original on site. It becomes part of the permanent project files. Send a copy to the Health and Safety Manager (HSM).

SITE NAME/NUMBER: San German Groundwater Contamination Site

DIVISION/LOCATION: San German, Puerto Rico

CERTIFICATION:

I understand, and agree to comply with, the provisions of the above referenced HASP for work activities on this project. I agree to report any injuries, illnesses or exposure incidents to the site Health and Safety Coordinator (SHSC). I agree to inform the SHSC about any drugs (legal and illegal) that I take within three days of site work.

PRINTED NAME	SIGNATURE	DATE

PRE-ENTRY BRIEFING AND DAILY SAFETY MEETING TOPICS

Site background, contaminant levels and exposure symptoms
PPE requirements for today
Buddy System and communication plan
Emergency Response
Daily tasks and associated risks; Hazard control
Injury and incident reporting
Mosquito Prevention
Heat Stress (weather forecast/conditions)

TRAINING REQUIREMENTS

All staff shall review the HASP
HAZWOPER 40-hour - all on-site staff
8-hour refresher - all on-site staff
Supervisor HAZWOPER training (H&S Coordinator)
1 onsite personnel must have CPR/First Aid Training
Certificates will be kept on-site

MEDICAL MONITORING

Medical monitoring for field staff are as per OSHA standards 29 CFR 1910.120 (f) and 29 CFR 1926.65 (f).
Copies of medical certificates shall be kept on-site.

EMERGENCY EQUIPMENT:

Eyewash;
Fire extinguisher (type ABC);
First aid kit

All equipment will be located either in the site vehicle or in the work zone.

HEAT STRESS MONITORING

See Attachment on Heat Stress, Appendix B - Workers will be encouraged to wear light colored clothing. If work is conducted above 70 degrees Fahrenheit, the scheme in Section 16 of the Corporate HASP that complies with OSHA's permissible heat exposure threshold limit values will be followed.

Heart rate check: count the radial pulse for 30 seconds at the beginning of the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work period to one third and maintain the same rest period.

Water bottles will be available for distribution; frequent work breaks will be provided to allow cool off periods and to replenish lost fluids from sweating. Cooling vests will also be made available if needed.

Work will be conducted in onsite shaded areas, where possible. Work schedule will be planned to minimize work during the hottest times of the day.

Recognition of heat stress and coping mechanism will be included in the tailgate safety meetings.

ROLES AND RESPONSIBILITIES

SSHO: Mr. Jose Reyes. The CDM Smith SSHO will be responsible for ensuring that the protocols specified in the HASP are followed during the field activities. The SSHO will also ensure that current copies of certificates, the HASP, and the CDM Smith Health and Safety Manual are maintained at the Site. He is responsible for upgrade of respiratory protection, if needed.

FTL: Mr. Jose Reyes, will be responsible for ensuring that all field tasks are conducted in strict compliance with the Quality Assurance Project Plan (QAPP). All field personnel will report directly to the FTL on all matters relating to the field investigation. The FTL will also be responsible for sampling activities and reports to the Site project manager.

Project HSM: Mr. Shawn Oliveira will be responsible for the review of the project-specific HASP.

RD Task Leader: Grace Chen will assist Mr. Brendan MacDonald, site manager, in implementing and coordinating the PDI activities. He will be responsible for all aspects of the pilot study field sample collection and the preparation of the document plans.

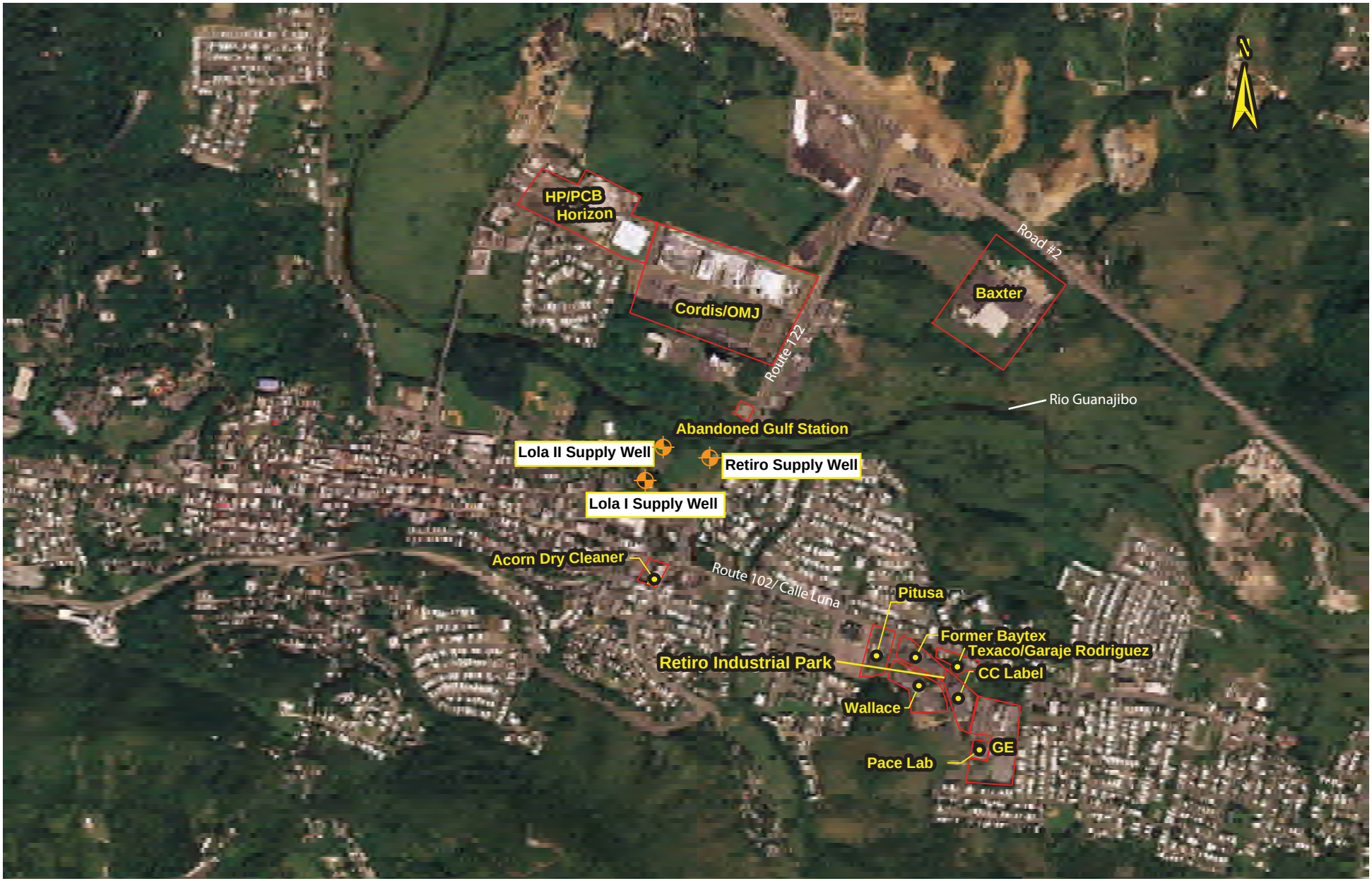
Field Team: To Be Determined.

Subcontractor: A Puerto Rico licensed driller will provide the drilling services and is responsible for carrying out tasks safely and for certifying the safety of their equipment on a daily basis. A building modification contractor certified in Puerto Rico is responsible for carrying out their tasks safely and for certifying the safety of their equipment.

Geologist: TBD, will be responsible for observing the stratigraphy of drilling material; documentation of work performed and oversight of soil logging, the driller, drilling activities and air monitoring activities.

Sampler/Scientist: TBD, will assist in the collection, preservation, and shipping of samples. The field scientist will be primarily responsible for generating the Scribe sampling paperwork and maintenance of chain of custody procedures. They will also be documenting sampling activities and submitting the chain of custody to the laboratory, EPA Regional Sampling Control Coordinator (EPA RSCC) (Ms. Cristina Leung) and Sample Management Office (SMO) and the CDM Smith Contract Laboratory Program (CLP) Coordinator (Ms. Vanessa Macwan).

Figures

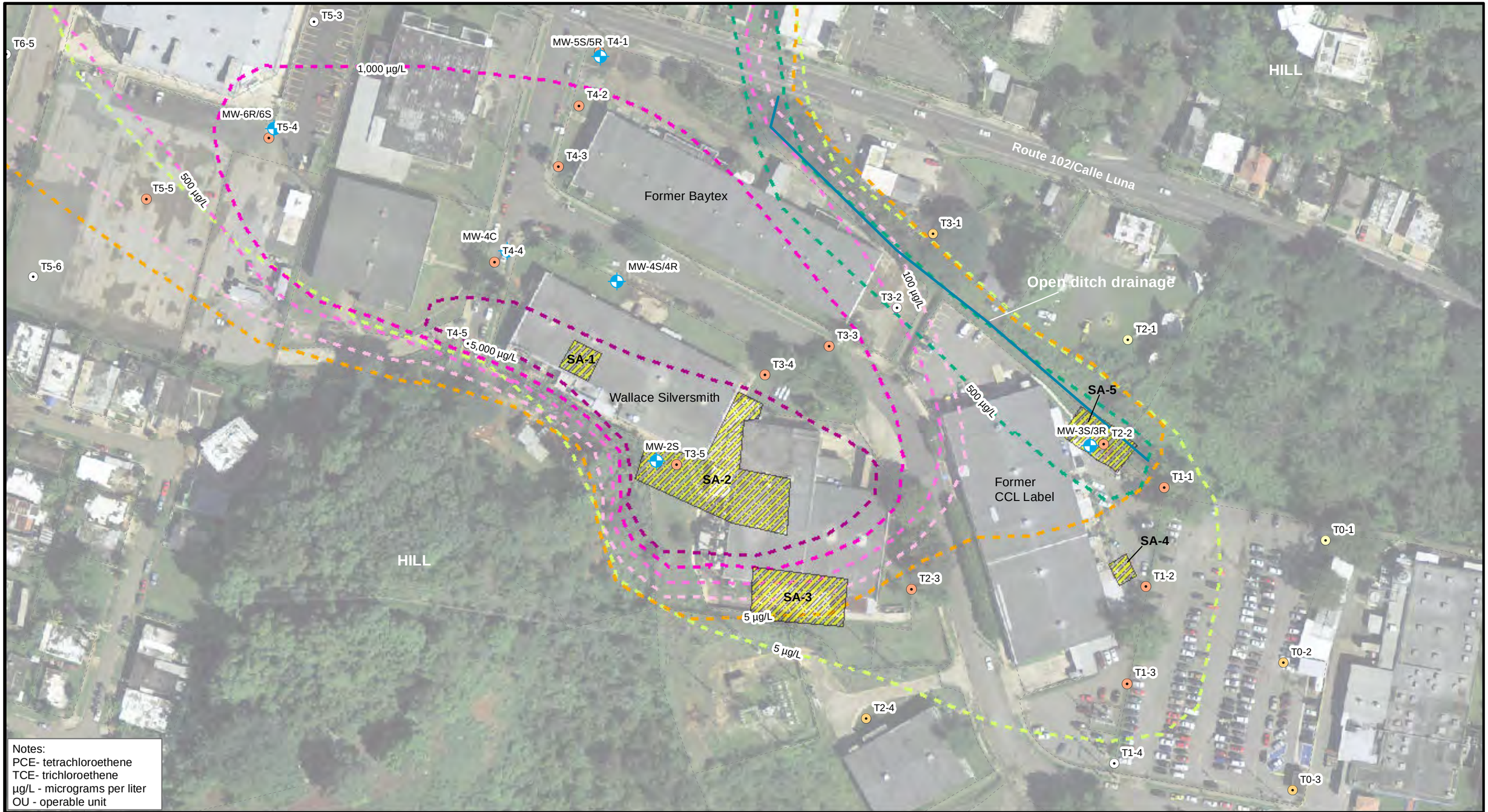


1,000 0 500 1,000

Approximate Scale (in feet)

Figure 1
Site Map
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



Notes:
PCE- tetrachloroethene
TCE- trichloroethene
µg/L - micrograms per liter
OU - operable unit

LEGEND

- Monitoring well
- SA-1 - Source area 1, estimated
- OU-1 Groundwater screening location having detections above MCLs
- OU-1 Groundwater screening location having detections below MCLs
- OU-1 Groundwater screening location having no detections
- OU-1 Groundwater screening dry location

PCE- tetrachloroethene

- Contour line for 5,000 µg/L
- Contour line for 1,000 µg/L
- Contour line for 500 µg/L
- Contour line for 100 µg/L
- Contour line for 5 µg/L

TCE- trichloroethene

- Contour line for 500 µg/L
- Contour line for 5 µg/L

N

0 45 90 180 Feet

Figure 2
Contamination Source Areas
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

Appendix A

Appendix A

Activity Hazard Analysis

[1] AHA No. 3323.075.01			
[2] Work Location: San German Groundwater Contamination Site- Remedial Design			
[3] Task Title: Drilling/soil boring installation/well installation, hydrogeologic assessment, soil and groundwater sampling			
[4] Work Phase: Remedial Design		**[5] List Work Groups Needed for Each Phase**	
A. Hydrogeologic assessment, drilling/soil boring installation and monitoring well installation		A. Geologist and rig crew	
B. Decontamination using a steam cleaner		B. Rig crew	
C. Aquifer testing, soil and groundwater sampling		C. Environmental scientists, geologists, rig crew,	
D. Site visits and site reconnaissance		E. Field team leader, RD task leader, and other site visitors	
This AHA shall be reviewed annually or as requested by the workers, supervisors, and/or safety representative			
[6] Activity Steps	**[7] Work Groups**	**[8] Hazards**	**[9] Hazard Controls (Engineered, Operational Documents, PPE, Qualifications)**
A. Drilling/soil boring installation/well installation/hydrogeologic assessment	Rig crew and geologists	a. Contamination	• At a minimum, plastic will be placed over the area to the drilled. If the contaminants warrant, plastic will be under the rig as well as a large area surrounding the rig. • If fuel or oil leaks on the plastic sheeting, absorbent pads will be used.

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational Documents, PPE, Qualifications)
A. Drilling/soil boring installation/well installation/hydrogeologic assessment (continuation)	Rig crew and geologists	b. Equipment failure/break-downs	• Prior to use all drill rigs and related equipment will be inspected by rig crew. • Drill rigs and support equipment will be inspected daily and documented by the equipment operator and verified by the site health & safety coordinator daily.
		c. Drill rig failure	• The mast and cables must be able to support all equipment and drill rods. • Wire cables must be maintained in good condition, free from kinks or broken strands. • All rotating shafts, pulleys or chains must be covered with protective guards. • All drill rigs must have an emergency kill switch, which is readily accessible to personnel at the rear of the rig. All personnel on the site will know the location of the kill switch and how to use it.
		d. Rig/equipment damage	• Wire cables will be inspected daily. Cables with broken strands, weak spots, kinking, or mashed areas will be replaced prior to use.
		e. Cathead hazard	• The operator must be trained and experienced in the use of cathead. • The rope must be in good condition. • The operator shall not wear loose clothing

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational Documents, PPE, Qualifications)
A. Drilling/soil boring installation/well installation/hydrogeologic assessment (continuation)	Rig crew and geologists	f. Unauthorized operation	• Only trained and authorized personnel will operate and/or assist in drilling operations. • Operator must comply with all applicable state certifications.
		g. Crushing injuries	• Drill rigs and drill bit stabilizer will be properly transported by either a rack, the rig, or utility trailer. • If transported on a trailer, the rods or stabilizers will be held securely in place. • If feasible, all vehicles and wheeled equipment will have chocks placed under the wheels to prevent rolling.
		h. Water tanks - failure, slippage	• All water tanks must be securely fastened to the truck frame. • Water tanks should be constructed of materials with adequate side strength, baffled to prevent the sloshing of water side to side, and must have lids with gaskets to prevent water loss.
		i. Fire prevention	• Drill rigs will contain at least on ABC type fire extinguisher. • Fire extinguishers will be fully charged and inspected weekly. • Fuels will be stored in appropriate containers.

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational Documents, PPE, Qualifications)
A. Drilling/soil boring installation/well installation/hydrogeologic assessment (continuation)	Rig crew and geologists	j. Severe weather	• Drilling will stop when rain interferes with the safety of the operators. • Drilling activities will stop during lightning. • Operators, crew, and other support personnel will move out of the exclusion zone and take shelter in other vehicles.
		k. Power lines/underground utilities	• Ensure that there are no power lines or underground utilities prior to drilling activities. • If work is near an overhead line, care will be taken to ensure there is a minimum of 10 feet of clearance when raising the mast. • While working near power lines, drill rods will not be leaned against the mast. • If the drill bit encounters anything hard, drilling will stop, and the Geologist will be notified.
		l. Head injury	• Hard hats will be required during drilling operations. • Hard hats will not be required during site set up but will be required once the mast has been raised.
		m. Back injuries	• Employees will use proper lifting techniques: Use legs to lift. Bend at knees and grip object with whole hand. Keep back as straight and vertical as possible. Center body weight over feet. Arms and elbows kept close to the body. Heavy or large objects shall be carried by two people or by machinery. Ensure pathways are clear.

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational Documents, PPE, Qualifications)
A. Drilling/soil boring installation/well installation/hydrogeologic assessment (continuation)	Rig crew and geologists	n. Slip/trips/falls	• Keep pathways clear of objects and electrical wires. • Avoid walking on plastic sheeting. Equipment will be stored away safely if not in use. • Good housekeeping requirements will be applied to all work areas. Coolers and bottleware will be stored unless in use. Staff is encouraged to get help or use proper lifting techniques. Spills should be cleaned up properly.
		o. Foot injury	• Leather steel-toe boots will be required.
		p. Hand injury	• Gloves will be worn during routine drilling activities. • Keep hands away from rotating augers, the hammer, and all other moving parts. • Leather gloves shall be worn when handling rough materials.
		q. Eye injury	• Safety glasses will be required during drilling operations.
		r. Hearing loss	• Hearing protection will be required during hammering operations.
		s. Ultra-violet exposure	• It is recommended that sunscreen be worn on all areas exposed to the sun.
		t. Dust Monitoring	• During indoor drilling events, engineering controls will be utilized to reduce dust production.

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational Documents, PPE, Qualifications)
B. Decontamination using a steam cleaner	Rig crew	a. Hand Injury	• Skid mounted steam cleaners will have protective guarding on all rotating shafts, belts, and pulleys • Nitrile gloves will be worn while operating the steam cleaner.
		b. Hearing loss	• Hearing protection will be worn during steam cleaning operation as determined by the site health & safety coordinator.
		c. Electrical	• If steam cleaners are being powered by a generator, a Ground-Fault Circuit Interrupter (GFCI) will be required.
		d. Fire	• Turn off the steam cleaner and allow it to cool before refueling. • Generators will be turned off while being refueled. • Smoking is prohibited during refueling operation.

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational Documents, PPE, Qualifications)
C. Aquifer testing, soil and groundwater sampling	Environmental scientists, geologists, rig crew	a. Environmental protection	• At a minimum, plastic will be placed over the area to be sampled.
		b. Equipment inspection	• Prior to use, all equipment will be inspected by health and safety and the site geologist or designate.
		c. Eye injury	• Safety glasses will be required during sampling operations. • Avoid hand to eye contact. • Wash hands after handling chemicals and samples
		d. Foot injury	• Leather, steel-toe, steel shank boots will be required.
		e. Hand injury	• Gloves will be worn during routine sampling activities. • Keep hands away from all moving parts.
		f. Unauthorized operation	• Only trained and authorized personnel will operate and/or assist in sampling operations.

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational Documents, PPE, Qualifications)
C. Aquifer, soil and groundwater sampling	Environmental scientists, geologists, rig crew	g. Slips/trips/falls	• Slippery conditions will be avoided. • Keep pathways clear of objects and electrical wires. Avoid walking on plastic sheeting. • Equipment will be stored away safely if not in use. • Good housekeeping requirements will be applied to all work areas. Coolers and bottleware will be stored unless in use. Staff is encouraged to get help or use proper lifting techniques. Spills should be cleaned up properly.
		h. Fire prevention	• Vehicles will contain at least one ABC type fire extinguisher. • Fire extinguisher will be fully charged and inspected weekly. • Fuels will be stored in appropriate containers
		i. Severe weather	• Sampling will stop when rain interferes with the safety of the operations. • Sampling activities will stop during lightning. • Samplers and other support personnel will move out of the exclusion zone and take shelter in other vehicles.
		j. Contact with preserving chemicals	• Handle with gloves, change gloves frequently. • Avoid contact of gloves with body parts and clothes • Never add water to acids • Avoid splashing • Wash/sanitize hands before eating
D. Site visits and site reconnaissance	Field task leader, RD task leader, and other	a. Slips/trips/falls	• Slippery conditions will be avoided.

[6] Activity Steps	[7] Work Groups	[8] Hazards	[9] Hazard Controls (Engineered, Operational Documents, PPE, Qualifications)
	site visitors	b. Biological hazards	• Bug spray will be available onsite.
		c. Uncontrolled access	• Visitors report to field trailer to SHSO or FTL upon arrival. Work areas will be delineated with flagging and/or caution tape to limit access to potential hazards.
E. Site Visits	Field task leader, RD task leader, and other site visitors	d. Driving Accidents	• Site health & safety coordinator will include training discussions during initial kickoff meeting to emphasize safe driving behaviors. Workers shall observe site speeding limits and traffic signs. Defensive driving habits and exhibition of driving courtesy will be encouraged.

[10] Attachments:			
Document Type	**Document Number**	**Applies to Work Group**	**For Work Step(s)/Phase(s)**
Comments:			
[11] References:			
Document Type	**Document Number**	**Applies to Work Group**	**For Work Step(s)/Phase(s)**
Corporate Health and Safety Plan	January 2012	All	All
[12] Subcontractor Approvals	**a. Print Name**	**b. Signature**	**c. Date**
1] Environmental, Safety, and Health			
2] Site Supervisor			

[13] Change Summary			
[6] Activity Steps	**[7] Work Groups**	**[8] Hazards**	**[9] Hazard Controls (Engineered, Operational Document, PPE, Qualifications)**
[14] Subcontractor Approvals	a. Print Name	b. Signature	c. Date
1] Environmental, Safety, and Health			
2] Site Supervisor			

PRE-JOB BRIEFING ATTENDANCE

AHA No.: 075-2	Job Title: AHA for ALL Tasks	Date:
Service Supervisor	Performer Organization:	Time:
I agree to work within the scope of work and follow the work controls described in the briefing.		

Name (Print)	Signature	Organization

Appendix B

Appendix B

Workplace Practices and Guidelines

Section 9
Personal Protective Equipment (PPE)

CDM Smith employees frequently perform tasks that require the use of protective clothing and equipment to shield or isolate them from chemical and physical hazards.

The nature and extent of potential chemical and physical hazards are key factor in choosing PPE. Before mobilization, CDM Smith performs a detailed review of the project site. We review site history, types, and quantities of materials handled at the site, operations performed at the project site, and activities we will perform during the course of the project.

9.1 Use of Personal Protective Equipment

Employees must use PPE identified in H&S plans, as directed by site managers, where recognizable hazards exist, to meet client requirements and in accordance with the guidelines described in this section. Employees must also inspect PPE assigned to them and have worn out or defective equipment replaced.

Personal protective equipment in use shall be inspected daily and maintained in serviceable condition. Items of personal issue shall be cleaned and sanitized as appropriate before any other employee uses them. Defective or damaged equipment shall be taken out of service immediately.

9.1.1 "Baseline" Protection

CDM Smith employees are expected to wear the ensemble of personal protective equipment listed below during all field tasks.

- Full-length trousers (See Section 9.2.10)
- Shirt with sleeves and a collar (See Section 9.2.10)
- Safety glasses with side shields (See Section 9.2.1)
- Hardhat (See Section 9.2.2)
- Steel toe and shank footwear (See Section 9.2.3)
- Protective gloves (if hands will contact rough or contaminated surfaces) (See Section 9.2.4)
- High-visibility vest (if vehicles or heavy equipment operate on site) (See Section 9.2.5)

9.1.2 Rules and Standards for PPE

Use of personal protective equipment is required by OSHA standards contained in 29 CFR 1910 and 29 CFR 1926, and reinforced by EPA regulations in 40 CFR Part 300. Types of protection required by OSHA and the relevant consensus standards are listed in **Table 9-2**.

9.2 Basic Personal Protective Equipment

9.2.1 Eye Protection

Employees should wear safety glasses during field activities unless it can be demonstrated that there are no potential hazards to the eye. Such hazards include active construction sites, hazardous waste sites and potential contact between hazardous or foreign substances and the eye.

For most dusts and particulates, safety glasses with side shields meeting the requirements of ANSI standard Z87.1-2003 - Occupational and Educational Eye and Face Protective Devices are adequate. For potential splash hazards of liquids, a face shield or splash hood should be used in conjunction with regular safety glasses. In some exposures to mist or heavy dust, goggles may provide the best form of eye protection. If lasers are used, specialized eye protection using specific lenses for the wavelength and energy emitted by a specific laser may be required.

Contact Lenses – Based on current information related to the use of contact lenses in the industrial work environment, contact lenses may be used in most situations. Eye protection such as safety glasses, face shields, or goggles appropriate for the hazards present should be used as well.

9.2.2 Hard Hats

Employees should wear hard hats meeting the requirements of ANSI Z89.1 (2009) unless the safety manager grants a waiver per Section 9.1.1.[no need for link here] Hard hats should be worn with the brim facing forwards unless there is a specific safety related reason to turn the hat backwards. In such instances the webbing in the hat shall be repositioned in the hat so that the back of the webbing is at the back of the head.

9.2.3 Foot Protection

Personnel should wear protective footwear when working on active construction sites, field hazardous waste sites and while performing work activities where there is a danger of foot injuries due to falling or rolling objects, objects piercing the sole, and where employees' feet are exposed to electrical hazards. Safety footwear shall meet the requirements of ASTM standards F2412-05 (Standard Test Methods for Foot Protection) and F2413-05 (Standard Specification for Performance Requirements for Foot Protection) and cover the ankle. Any footwear worn for fieldwork must have a good sturdy tread appropriate for outdoor use and a defined heel.

9.2.4 Hand Protection

Various types of gloves are available for protection against cuts, scrapes, bruises, etc. that may occur during the physical handling of material, equipment tools etc. Gloves should have the qualities required for the work conditions as set by ANSI/ISEA 105 American National Standard for Hand Protection Selection Criteria. [would a link to a glove selection table be appropriate here?]CDM Smith issues cotton, leather, nitrile, neoprene, and Kevlar® gloves depending on the work activity and potential hazards. If needed, leather or mesh work gloves can be worn over chemical protective gloves.

9.2.5 High-Visibility Clothing

High-visibility vests or jackets are required whenever personnel work in or around vehicular traffic. High-visibility clothing should meet the level of visibility required for the work conditions in ANSI / ISEA 107 (2010). Employees should also wear high-visibility clothing on active construction or industrial sites where there is frequent movement of trucks, excavation, or other heavy equipment. See Section 16.22 Traffic and Work Zone Safety.

9.2.6 Protective Clothing

Personnel should wear protective clothing in circumstances where there is the potential for hazardous dusts, toxic or contaminated material, mists, or liquids contact the employee's skin or personal clothing. Protective clothing may include disposable or reusable coveralls, polymer coated coveralls, or splash suits. When there is a significant potential for direct contact of liquids or mists, polymer-coated coveralls or splash suits are indicated.

Selection consideration should be given to such factors as size, durability, chemical compatibility, and heat stress potential. Project managers are particularly reminded to consider the correct size of protective garment for very large and small workers. When ANSI/ISEA standard 103, Classification and Performance Requirements for Chemical Protective Clothing, is published, CDM Smith expects to implement its requirements.

Chemical Protective Footwear – Chemical protective footwear should be worn when there is the potential for boots to come into direct contact or be splashed with hazardous materials or waste. When direct contact hazards exist, chemical resistant boots may be worn or boot covers may be worn.

Chemical Protective Gloves – For those activities where there is a potential for direct contact with hazardous or toxic materials, or contaminated soil or groundwater, employees should wear chemical protective gloves. The selection of glove should be based on the activity and the material of potential contact. A wide variety of gloves are available and consideration should be given to dexterity, durability, and material compatibility. Gloves should have the qualities required for the work conditions as set by ANSI/ISEA 105 American National Standard for Hand Protection Selection Criteria.

Flame and Arc – Flash Protective Clothing – Fire resistant clothing used where fires or electrical arcs are a problem shall have a rating of at least HRC Level 2 as set by NFPA Code 2112 Standard on Flame Resistant Garments for Protection of Industrial Personnel against Flash Fire. NOTE: If an arc flash study described in Section 16-4 requires a higher level of protection, wear that level.

9.2.7 Respirators

CDM Smith may issue a respirator to individuals who will frequently use respiratory protection. Employees who are expected to work on projects where the use of respiratory protection is anticipated or required must fulfill the training and medical approval requirements for respirators as described in Section 11, Respiratory Protection of this manual.

9.2.8 Hearing Protection

Employees shall use hearing protection when noise levels exceed the allowable limit. A Hearing Conservation Program (Section 14) shall be implemented if the allowable limits are exceeded. Devices used for hearing protection shall be certified for the purpose per USEPA regulation 40 CFR 211 subpart B *Noise Labeling Standards for Hearing Protection Devices.*

9.2.9 Specialized Protective Equipment

Specialized protective equipment is available for a wide variety of activities and includes:

- Fall protection harnesses and lanyards (See Safety Guideline 16.7)
- Face shields
- Chaps for work in rough brush
- Spark resistant tools
- Shin guards for chain saws
- Cooling vests (See Safety Guideline 16.13)
- Personal floatation devices

9.2.10 Personal Work Clothing

Employees are expected to supply personal clothing appropriate for their work assignments including long pants, a shirt with sleeves (at least 4" long). NOTE: Some CDM Smith clients insist that employees wear long-sleeve shirts.)

Employees are expected to provide basic outerwear appropriate for protection against normal weather conditions in the geographical areas they are normally assigned. The equipment centers do stock clothing for extreme cold or wet weather. (See Safety Guideline 16.14.) These include rain suits, insulated coveralls, cold weather work gloves, hardhat liners, etc. Employees may request this equipment directly from the equipment centers.

9.3 Availability of PPE

CDM Smith field equipment centers maintain an inventory of basic PPE including hard hats, safety glasses, hearing protection, harnesses, traffic vests, etc. The specific make and model of equipment is reviewed periodically by the H&S managers to ensure equipment issued to CDM Smith Inc. personnel is of adequate quality. Projects and employees may obtain basic PPE by requesting equipment from the field equipment centers by telephone or through the field equipment center website at http://cdmweb/fieldequipment/ .

9.3.1 PPE Assigned to the Employee

CDM Smith typically assigns items such as hardhat, safety glasses, hi-visibility vests etc to individual employees. The employee's Group Leader or Direct Manager, in consultation with the H&S Manager assigned to support the employee's division, shall decide what PPE employees need, based on their expected role, and help to arrange for

it. Employees may, with the approval of their manager or group leader, submit a PPE request.

PPE required for use on CDM Smith work activities is provided to CDM Smith employees at no expense to the employee.

9.3.2 Project vs. Overhead Expense

PPE that is used to support activities for specific projects should be charged to those projects. Typical project specific PPE would include consumables such as gloves, disposable Tyvek® suits, respirator cartridges, etc. Non - disposable PPE, used on a specific project can be obtained from the equipment centers for short or moderate durations on a rental basis. In some cases it may be more cost effective for projects to have the equipment centers purchase the equipment for the project. Non-disposable PPE may include respirators, air-supplied respiratory protective systems, or specialized chemical protective clothing. The specific PPE ensemble for a specific project will be identified in the project specific H&S plan and approved by the service group H&S manager responsible for that project.

Employees may request equipment using the Personal Protective Equipment Request form in Appendix A of this section. Individual PPE that is assigned to a specific employee for use on multiple projects should be charged to the employee's division safety equipment overhead number, typically 0000 <DIV> ADMIN.SAFQP. The employee's Group Leader or Direct Manager, with the advice of the relevant health and safety manager, shall decide what PPE may be charged to an overhead account.

Reimbursement for Safety Footwear – CDM Smith will reimburse CDM Smith employees for the cost of purchasing safety footwear up to a maximum amount of $150.00.

Reimbursement for Prescription Safety Glasses – CDM Smith employees, who require prescription glasses and are expected to work more than 30 days per year in the field or on locations where safety glasses are required, will be reimbursed for the cost of prescription safety glasses meeting the requirements of ANSI Z87.1 up to a maximum of $175.00. Employees who wear prescription glasses and work less often on projects that require the use of safety glasses should be provided eye protection that fits over their glasses.

Employees may request reimbursement through the expense account system from their resource manager or group leader. The resource manager or group leader shall make the final determination as to whether or not safety glasses are a reimbursable item as described above.

Employees are eligible for this allowance whenever their existing equipment becomes unsafe to use. If, for example, pair of safety glasses breaks the day after CDM Smith pays for them, the employee is eligible to use the allowance again. If the steel-toe shoes are still fully functional 15 years after purchase, the employee is not.

9.4 Levels of Protection

Each type of protective equipment has been designed specifically to protect against a reasonably anticipated chemical and physical hazard. To standardize PPE ensembles, "levels of protection" have been defined to address those chemical and physical hazards that may be present at hazardous waste sites. The levels of protection are defined accordingly:

Level A	This level is worn when the highest level of respiratory, skin, and eye protection is anticipated as being required.
Level B	This level is worn when the highest level of respiratory protection is anticipated as being required, with a lesser level of skin protection being necessary.
Level C	This level is worn when criteria for air-purifying respirators are determined to be necessary and a lesser level of skin protection needed.
Level D, Modified	This level is worn when activities do not pose a problem from a respiratory protection point of view but may present a skin problem and where cross contamination via shoes needs to be considered.
Level D	This level is worn when activities and areas do not present a respiratory or skin hazard.

Detailed equipment, use, and limitations associated with each level of protection appear in **Table 9-1**.

Table 9-1

Levels of Protection

Level	Equipment	Protection Provided	Should be Used When:	Limiting Criteria
A	**Recommended**: ▪ Pressure-demand, full facepiece self-contained breathing apparatus (SCBA) or pressure-demand supplied-air respirator with escape SCBA ▪ Full-encapsulating, chemical-resistant suit ▪ Inner chemical-resistant gloves ▪ Chemical-resistant safety boots/shoes ▪ Two-way radio communications **Optional:** ▪ Cooling unit ▪ Coveralls ▪ Long cotton underwear ▪ Hard hat ▪ Disposable gloves and boot covers	The highest available level of respiratory, skin, and eye protection	▪ The chemical substance is thought to require the highest level of protection for skin, eyes, and the respiratory system based on either: - Measured (or potential for) high concentration of atmospheric vapors, gases, or particulates - Site operations and work functions involving a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through intact skin ▪ Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible ▪ Operations must be conducted in poorly ventilated areas until the absence of conditions requiring Level A protection is determined	Fully encapsulating suit material must be impermeable to the substances involved The use of Level A protection severely limits the practical duration of work effort.

Table 9-1 (Continued)

Level	*Equipment*	*Protection Provided*	*Should be Used When:*	*Limiting Criteria*
B	**Recommended:** ▪ Pressure-demand, full-facepiece SCBA or pressure-demand supplied air respirator with escape SCBA ▪ Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one-piece chemical splash suit; disposable chemical resistant one-piece suit) ▪ Inner and outer chemical-resistant gloves ▪ Chemical-resistant safety boots/shoes ▪ Hard hat ▪ Two-way radio communications **Optional**: ▪ Coveralls ▪ Disposable boot covers ▪ Face shield ▪ Long cotton underwear	The same level of respiratory protection but less skin protection than Level A It is the minimum level recommended for initial site entries until the hazards have been further identified	▪ The type and atmospheric concentrations of substances have been identified and require a high level of respiratory protection, but less skin protection. This involves atmospheres: - With IDLH concentrations of specific substances that do not represent a severe skin hazard *or* - That do not meet the criteria for use of air-purifying respirators ▪ Atmosphere contains less than 19.5 percent oxygen ▪ Presence of incompletely identified vapors or gases is indicated by direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin	Used only when the vapor of gases present are not suspected of containing high concentrations of chemicals that are harmful to skin or capable of being absorbed through the intact skin Use only when it is highly unlikely that the work being done will generate either high concentrations of vapors, gases, or particulates or splashes of material that will affect exposed skin

Table 9-1 (Continued)

Level	*Equipment*	*Protection Provided*	*Should be Used When:*	*Limiting Criteria*
C	**Recommended:** ▪ Full-facepiece, air-purifying, cartridge-equipped respirator ▪ Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one-piece chemical splash suit; disposable chemical-resistant one-piece suit ▪ Inner and outer chemical-resistant gloves ▪ Chemical-resistant safety boots/shoes ▪ Hard hat ▪ Two-way radio communications **Optional:** ▪ Coveralls ▪ Disposal boot covers ▪ Face shield ▪ Escape mask ▪ Long cotton underwear	The same level of skin protection as Level B, but a lower level of respiratory protection	▪ The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin ▪ The types of air contaminants have been identified, concentrations measured, and a cartridge is available that can remove the contaminant ▪ All criteria for the use of air-purifying respirators are met	Effective only against conditions that are fairly well understood. Not effective for conditions that involve: • Unknown chemicals that the filtering element might not remove well • Oxygen-deficient atmospheres • Unpredictable concentrations that might overwhelm the filtering element
D MODIFIED	**Recommended:** ▪ Chemical-resistant outer gloves ▪ Disposable shoe covers ▪ Work clothes ▪ Safety boots/shoes ▪ Safety glasses or chemical splash goggles ▪ Hard hat	No respiratory protection; minimum skin protection	▪ The atmosphere contains no known hazard ▪ Work functions may involve skin contact with hazardous chemicals	

Table 9-2 OSHA & Consensus Standards for Personal Protective Equipment		
Type of Protection	**Regulation**	**Reference**
General	29 CFR 1910.132	41 CFR Part 50-204.7 General Requirements for Personal Protective Equipment
Eye and Face	29 CFR 1910.133(a)	ANSI standard Z87.1-2003 - Occupational and Educational Eye and Face Protective Devices
Noise Exposure	29 CFR 1910.95	USEPA 40 CFR 211 subpart B
Respiratory	29 CFR 1910.134	ANSI-[1] Z88.2 (1992) Standard Practice for Respiratory Protection
Hand	29 CFR 1910.132	ANSI/ISEA 105 American National Standard for Hand Protection
Head	29 CFR 1910.135	ANSI Z89.1 (2009) Safety Requirements for Industrial Head Protection
Foot	29 CFR 1910.136	ASTM F2412-05and F2413-05
Electrical Protective Devices	29 CFR1910.335(a)(2)	NFPA 70E: Standard for Electrical Safety in the Workplace
Flame – Resistant Garments	29 CFR1910.335(a)(2)	NFPA Code 2112 Standard on Flame Resistant Garments
Chemical Protective Clothing	29 CFR 1910.132	ANSI/ISEA standard 103, Chemical Protective Clothing (Draft)
High-Visibility Safety Apparel	29 CFR 1926.651(d)	ANSI / ISEA 107(2010) National Standard for High-Visibility Safety Apparel

[1] *American National Standards Institute (ANSI), http://www.ansi.org/*

Appendix A

Personal Protective Equipment Request Form

Employee _____ **Division** _____ **Office**_____

Active in CDM Smith Medical Surveillance Program? Yes ___ No ___

Date of last CDM Smith medical exam? _____

Equipment Requested

Item	Requested	Issued
Hard Hat	_____	_____
Safety Glasses	_____	_____
Hi-Visibility Vest	_____	_____
Fall Protection Harness	_____	_____
Work Gloves (____ pairs)	_____	_____
Glove Liners (____ pairs)	_____	_____
Electrical Gloves (____ pairs)	_____	_____
Rain suit	_____	_____
Cloth Coveralls	_____	_____
Fire – Resistant Coveralls	_____	_____
Insulated Coveralls	_____	_____
Goggles	_____	_____
Ear Muffs (____ pairs)	_____	_____
Respirator	_____	_____
Make_____		
Model_____		
Size_____		
Corrective Lens Inserts	_____	_____
_____	_____	_____
_____	_____	_____

You must take reasonable measures to safeguard the items issued to you. Should your employment with CDM Smith terminate for any reason you must return equipment issued for your use. Any loss, theft, or damage of the equipment should be reported promptly to the Equipment Center manager.

Approved by:

_____ _____ _____

Group Leader or Direct Manager/Date Division Charge Number

Section 14
First Aid & Bloodborne Pathogens

14.1 Purpose and Scope

This section describes how CDM Smith provides First Aid Coverage for employees working in it's offices and is intended to meet the requirements of the OSHA General Industry Standard for Medical Services and First Aid (29 CFR 1910.151) and the OSHA Bloodborne Pathogens Standard (29 CFR 1910.1030). CDM Smith employees not working for CDM Constructors, Inc. do not engage in construction work and are **not** subject to the OSHA Construction Industry Standard for Medical Services and First Aid, (29 CFR 1926.50).

14.2 First Aid

14.2.1 Offices

All CDM Smith offices have readily available access to municipal emergency services and are in areas where 911 or other local notification of emergency services are available. Procedures to summon emergency services are provided to new employees during the new employee orientation and are listed in each office's Emergency Plan. In addition, in most cases office security personnel (non-CDM Smith employees) have first aid and/or CPR training and may provide first aid to office occupants. Some CDM Smith employees voluntarily take first aid and CPR training and may provide first aid to employees who may be injured in the office. However, they are not obligated to do so and providing first aid is not considered part of their job function (Note: Employees who volunteer to provide first aid are considered "Good Samaritans" and are not subject to the OSHA Bloodborne Pathogens Standard).

All offices are required to be equipped with a first aid kit appropriate for the number of personnel working in the office and the kit is intended to serve. First aid kits should be located with the office receptionist or kitchen or break area, stored in weatherproof containers containing individually sealed items. CDM Smith has over 100 office locations, with as few as 4 employees to over 500 employees in a given location. There is no one standard office first aid kit that applies to all office locations. Office first aid kits should be checked and maintained by the office services or health and safety coordinator. Alternatively arrangements can be made with a local vendor to check and maintain first aid kits. The responsibility for having and maintaining a first aid kit appropriate for the office lies with local office management. The contents of a typical first aid kit are shown in Exhibit 14-A.

Employees that voluntarily participate in first aid/CPR training shall be provided information on:

- Hazards associated with bloodborne pathogens and potential routes of exposure,
- Universal precautions, and
- This procedure and the opportunity for post-exposure evaluation and follow up.

14.2.2 Field Engineering Activities

Field engineering projects at locations where access to a medical facility, hospital or other provider of first aid services is not in near proximity shall include an employee or subcontractor employee who is trained in first aid and have access to a first aid kit. (Note: This does not apply to project locations controlled and operated by an owner or third party that have first aid and or emergency services available in proximity to the project location.) Field engineering projects where a first aid trained employee is required by contract shall also have an employee or subcontractor employee assigned to the project site who is trained in first aid and have access to a first aid kit.

First aid supplies shall be stored in a weatherproof container and contain individually sealed items. The First aid kit will be checked by the project manager or by a designee prior to commencing work at the project location. First aid supplies will be restocked as needed and checked weekly by the project H&S coordinator.

Field engineering projects with potential exposure to corrosive materials or eye irritants shall have available a portable eyewash station or bottle.

A list of supplies provided in a typical field or office first aid kit is provided in Exhibit 14-A

14.2.3 Automatic External Defibrillator (AED) (For offices/locations with access to AEDs)

Any employee who is expected to provide emergency care will be trained in Cardiopulmonary Resuscitation (CPR) and AED use according to the American Heart Association, American Red Cross standards, National Safety Council or other equivalent programs.

First Aid Providers

A First Aid Provider is an employee working within the office or project site that has completed a qualified program of First Aid/CPR/AED training and meets the training requirements to use an AED. Where required by contract or H&S plan, designated individuals will be listed within the office emergency plan or the site-specific HASP plan.

Emergency Response Action

Employees treating a non-responsive person will call 911 or have another employee call.

Assessment/Intervention

- Assess situation/scene safety.
- Evaluate patient's consciousness, breathing and circulation status.

- If a child, establish the victim's age (AEDs are not recommended for children younger than 8 years of age).
- Follow manufacturer's recommended guidelines for use of available AED.

Post Event Action

- Replace any used AED equipment as recommended.
- Provide requested information to medical director

Equipment Maintenance Plan

- Develop written monthly and annual AED maintenance plan per manufacturer's recommendations.
- Assign individual(s) responsible for AED maintenance. This may be a qualified 3rd party provider.

Physician Oversight

- Medical oversight to provide a prescription to purchase an AED and assists with quality assurance.

14.3 Bloodborne Pathogens

14.3.1 Exposure Assessment

The program applies to all CDM Smith employees who may be occupationally exposed to blood or other potentially infectious materials.

CDM Smith employees do not normally work where skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials would reasonably result from the normal performance of their duties.

There are two job functions that may reasonably expose employees to blood or other infectious materials without regard to the use of PPE;

List of Exposure Determinations

1. Employees assigned to provide first aid services on field engineering projects.

2. Employees assigned to solid waste characterization projects.

CDM Smith's medical consultants evaluated the risk associated with potential hepatitis exposure to employees working around sewage and wastewater treatment plants and the merits of providing prophylactic vaccination against hepatitis. They provided a written opinion indicating that the risk of contracting hepatitis did not warrant administration of the vaccine. The full text of the physician opinion is available on the H&S home page.

14.3.2 Exposure Control Plans

Exposure Controls for Field Engineering Project First Aid Providers

Employees providing first aid care in the field shall observe "universal precautions" and use PPE provided in first aid kits. "Universal precautions" are defined as "an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens."

First aid kits shall contain appropriate PPE such as latex gloves and face shields. Employees working on field engineering project normally wear safety glasses. Employees shall wear the provided PPE when providing first aid when designated as a field project first aid provider.

In addition, first aid kits shall contain hand sanitizer or disinfectant wipes employees are to use after providing first aid.

Any bandages or blood soaked materials shall be place in a leak proof plastic bag for proper disposal. Any employee clothing soiled with blood or infectious material while applying first aid shall be cleaned or disposed of and replace at CDM Smith's expense.

Employees who are assigned responsibilities as first aid providers on field engineering projects shall be provided the opportunity be vaccinated for Hepatitis B at CDM Smith's expense.

Employees who are assigned responsibilities as first aid providers on field engineering projects shall be provided information on:

- Hazards associated with bloodborne pathogens and potential routes of exposure,
- Universal precautions, and
- This procedure and the opportunity for post-exposure evaluation and follow up.

Exposure Controls for Solid Waste Characterization Projects

Employees engaged in solid waste characterization projects shall observe "universal precautions" and use appropriate PPE identified in a project H&S plan and provided by CDM Smith. "Universal precautions" are defined as "an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens."

Employees who are assigned to solid waste characterization projects that come into direct contact waste material shall be provided the opportunity be vaccinated for Hepatitis B at CDM Smith's expense.

Employees who are assigned to solid waste characterization projects shall be provided information on:

- Hazards associated with bloodborne pathogens and potential routes of exposure,
- Universal precautions, and
- This procedure and the opportunity for post-exposure evaluation and follow up.

14.3.3 Post-Exposure Evaluation and Follow-Up

Following a verbal report of an exposure incident, the direct manager, resource manager, HSC or HSM should immediately offer the exposed employee confidential medical evaluation and testing as well as a post-exposure hepatitis vaccination. The results of medical evaluations and test data maintained by CDM Smith's medical consultant will be reported only to the employee or someone they designate in writing. The examining physician will inform CDM Smith's H&S staff or Human Resources manager only if needed to provide adequate support to affected employee.

Post-exposure evaluation and follow-up should consist of the following steps:

- Documentation of the route(s) of exposure.
- Collection and testing of blood of the exposed employee for HBV and HIV serological status with employee's consent. After obtaining the exposed employee's consent for follow-up testing, a sample of his/her blood shall be collected and tested for HBV and/or HIV as soon as feasible following the exposure incident.
- If the exposed employee consents to baseline blood collection, but does not give consent at that time for HIV serological testing, the sample shall be preserved for at least 90 days. If, within 90 days of the exposure incident, the employee elects to have the baseline sample tested, such testing shall be done as soon as feasible.
- Post-exposure prophylaxis as recommended by the CDM Smith medical consultant when medically indicated. Note: To have maximum potential effect, initiation of post exposure Hepatitis B vaccination should begin within 48 hours of the exposure incident.
- Counseling.
- Evaluation of reported illnesses.

Following post-exposure evaluation and follow-up, the exposed employee shall be provided with a copy of the evaluating healthcare professional's written opinion.

Incident Reporting

Exposure incident means a specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that

results from the performance of an employee's duties. If an exposure incident occurs while the employee is in a work setting or while working for CDM Smith, the following steps should be taken:

- Employees shall notify their direct manager, resource manager, HSC, or division HSM as soon as feasible following an exposure incident.
- Employees shall complete a bloodborne pathogen (BBP) occupational exposure report, available in Exhibit 14-B of this section or in the Forms section of the H&S Web site. Employees shall sign the BBP occupational exposure report and give the signed and completed form to his/her direct manager or resource manager for review and sign-off.
- The direct manager or resource manager shall forward a copy of the report to the division HSM.

Post-Exposure Testing of the Source Individual

- CDM Smith shall make a good faith effort to identify and obtain consent for HBV and HIV testing of the source individual.
- The source individual's blood shall be collected and tested as soon as feasible and after consent is obtained in order to determine HBV and HIV infectivity.
- If consent is not obtained, CDM Smith shall establish that legally required consent cannot be obtained, and the source individual shall not be tested.
- When the source individual's consent is not required by law, the source individual's blood, if available, shall be collected, tested, and the results documented. The condition "if available" applies to blood samples that have been drawn from the source individual for other testing.
- When the source individual is already known to be infected with HBV or HIV, testing for the source individual's known HBV or HIV status need not be repeated.
- Results of the source individual's testing shall be made available to the exposed employee, and the exposed employee shall be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.

14.3.4 Training and Medical Records

Training records for all employee training are maintained in CDM Smith's Learning Management System and include date of training, training content, names and job titles. Records are maintained for the duration of employment or 3 years whichever is greater.

The results of medical evaluations and test data maintained by CDM Smith's medical consultant will be reported only to the employee or someone they designate in writing. The examining physician will inform CDM Smith's H&S staff or Human Resources manager only if needed to provide adequate support to affected employee. Records will be provided in a timely manner at no cost to the employee.

Employees are notified of the right to access to medical records associated with their employment at CDM Smith annually.

14.4. BBP Engineering Controls

Virtually all of CDM Smith's potential occupational exposure to blood or other infectious materials occurs in field locations where there are no fixed facilities making implementation and maintenance of engineering controls not feasible. Protection from BBP is provided through administration of proper work procedures, use of PPE and follow up.

Exhibit 14-A Typical First Aid Kit Contents for up to 50 personnel

50 - 1 x 3 Adhesive Bandages
10 - Knuckle Adhesive Bandages
3 - Fingertip Adhesive Bandages
1 - 2 inch Sterile Gauze Rolled Bandage
2 - 3x3 Sterile Gauze Pads (2/pk)
3 - 4x4 Sterile Gauze Pads (2/pk)
1 - Triangular Bandage
1 - 5" x 9" Trauma Pad (sterile)
2 - Sterile Eye Pads
1 - 1/2 inch x 10 yds Medical Tape
4 - Latex Gloves
15 - BZK Antiseptic Wipes (no alcohol)
6 - Triple Antibiotic Ointment packs
4 - Sting Relief Pads
1 - Instant Cold Pack
1 - Scissor
1 - Tweezer
1 - 4 oz. Eye Wash
6 - WaterJel Foil Packets
1 - CPR Filtershield
Acetaminophen Packets(optional)
Aspirin Packets (optional)
1 - First Aid Guide

Exhibit 14-B Bloodborne Pathogens Exposure Incident Report

Section 1 – To be completed by Exposed Employee, Local Team Leader or Direct Manager. Information about Exposed Employee:

First Name: _____ Middle Initial: _____

Last Name: _____ Division: _____

Office: _____ Employee Number _____

Sex: ☐ M ☐ F Age: __

Address: _____

_____

Phone Number: _____

Employment Category: **Length of Employment:** **Time in Occupation:**

☐ Regular Full time ☐ Regular Part time ☐ Temporary ☐ Non-employee

Section 2 – To be completed by Exposed Employee, Local Team Leader or Direct Manager. Information about Exposure Incident:

Date of Incident _____ Time: _____

Specific Location of Incident: _____

Witness(es) to the Incident: _____

Employee's Usual Occupation: _____

Occupation at Time of Incident: _____

Local Team Leader or Direct Manager: _____

Phase of Employee's Workday at Time of Injury:

☐ Performing Work Duties ☐ During Meals ☐ During Rest Period

☐ Entering or Leaving Workplace ☐ Other _____

General Type of Task Being Performed at Time of Incident: _____

_____

Supervision at Time of Accident:

☐ Directly Supervised ☐ Indirectly Supervised ☐ Not Supervised ☐ Supervision Not Feasible

Exhibit 14-B Bloodborne Pathogens Exposure Incident Report (Continued)

Description of Exposure Incident:

Location: _____ Date: _____ Time: _____

Details of Exposure Incident – Identify Type of Exposure, Frequency, Duration, Intensity and Exposure Route

_____

_____

_____

_____

_____

_____

Name, Address, and Phone Number of Attending Physician (If Applicable): _____

_____

Section 3 –	**To be completed by Exposed Employee, Local Team Leader or Direct Manager. Information about the Exposure Source (If known):**

Name of Source Individual (If known): _____

Employer of Source Individual: _____

Contact Phone Number: _____

_____

_____

Section 15
Hearing Conservation

15.1 Purpose and Scope

The purpose of this section is to prevent permanent and temporary occupational hearing loss that results from overexposure to noise. This section is applicable to all CDM Smith employees and to all equipment and property used by CDM Smith.

15.2 Definitions

Action Level - An exposure to an 8-hour time-weighted average of 85 decibels measured with a dosimeter or sound-level meter on the A-scale at slow response; or equivalently, a dose of 50 percent measured as per Subsection 15.5.5. The action level is the criterion for instituting noise surveys and employee participation in the audio metric testing program.

Administrative Control - Any procedure that limits noise exposure by control of work schedules.

Audiogram - A chart, graph, or table that results from an audiometric test. An audiogram shows an individual's hearing threshold level as a function of frequency (Hz).

Audiologist - A professional who specializes in the study and rehabilitation of hearing and who is certified by the American Speech, Hearing, and Language Association or licensed by a state board of examiners.

Audiometer - An electronic instrument that measures hearing threshold levels and conforms to the requirements and specifications of the current ANSI Standard S3.6.

Baseline Audiogram - An audiogram against which future audiograms are compared. It may also be described as a reference, pre-placement, pre-assignment, or entrance audiogram.

Biological "Functional" Calibration Check - An audiometric test that uses one or more individuals with known, stable hearing levels to check proper functioning and stability of an audiometer and to identify any unwanted or distracting sounds.

Cut-Off Level - All sound levels at or above the cut-off level are averaged into the calculations that relate to noise exposure. All sound levels below the cut-off level are not included.

Deafness: The condition in which the average hearing threshold level for pure tones at 500; 1,000; 2,000; and 3,000 Hz (frequencies used for speech) is at least 93 decibels (reference ANSI S3.6-1969). This is generally accepted as representing a 100 percent hearing handicap for normal speech.

Decibel (dB) - A unit of measurement of sound-pressure level. The decibel level of a sound is related to the logarithm of the ratio of sound pressure to a reference pressure. The dB has meaning only when the reference is known. The internationally accepted reference pressure used in acoustics is 20 micropascals.

Decibels, A-Weighted (dBA) - A sound level reading in decibels made on the A-weighting network of a sound-level meter at slow response.

Decibels, Peak (dBP) - A unit used to express peak sound-pressure level of impulse noise.

Dose Criterion Sound Level - The average sound level at a given dose criterion length for which the dose represents 100 percent of the allowable exposure. The Federal Occupational Safety and Health Administration (Fed-OSHA) requires a dose criterion sound level of 90 dBA for an exposure duration of 8 hours. ARC has a dose criterion level of 85 dBA for an 8-hour exposure, per Section 29.6.

Dose Criterion Length - The permissible exposure duration (in hours) for a given dose criterion sound level for which the dose represents 100 percent of the allowable exposure.

Eight-Hour Dose - The actual dose (as a percentage) accumulated over the duration of the work shift and based on a regulations defined criterion level and criterion length.

Engineering Control - Any mechanical device, physical barrier, enclosure, or other design procedure that reduces the sound level at the source of noise generation or along the path of propagation of the noise to the individual. This does not include protection equipment such as earmuffs, plugs, or administrative controls.

Hazardous Noise - Noise generated by an operation, process, or procedure that is of sufficient duration and intensity to be capable of producing a permanent loss of hearing in an unprotected person. Generally, this is interpreted as persistent noise levels equal to or greater than 85 dBA or combinations of higher intensities for durations shorter than 8 hours.

Hertz (Hz) - A unit of measurement of frequency that is numerically equal to cycles per second.

Impulsive or Impact Noise - Variations in noise levels that involve peaks of intensity that occur at intervals of greater than 1 second. If the noise peaks occur at intervals of 1 second or less, the noise is considered continuous.

Lav - The average sound level (in dBA) computed for a chosen averaging time duration.

Lav (80) - The average sound level (in dBA) computed for a chosen averaging time duration, using an 80-dBA cut-off level. The 80-dBA cut-off level is used by Fed-OSHA for hearing conservation compliance requirements.

Manager - A broad term that can refer to managers, program and project managers, direct managers, site managers, supervisors, department heads, group heads, branch chiefs, owners, and/or persons that operate in a management capacity or supervisory roll with respect to affected employees.

Medical Pathology - A disorder or disease. For the purposes of this chapter, a condition or disease that affects the ear and should be treated by a physician specialist.

Monitoring Audiogram - An audiometric test obtained at least annually to detect shifts in an individual's threshold of hearing by comparison to the baseline audiogram.

Noise - Unwanted sound.

Noise Dose - A measure of cumulative noise exposure over a stated period, which takes into account both the intensity of the sound and the duration of the exposure.

Noise Dosimeter - An electronic instrument that integrates cumulative noise exposure over time and directly indicates a noise dose.

Noise Hazard Area - Any work area with a noise level of 85 dBA or greater.

Otolaryngologist - A physician who specializes in the diagnosis and treatment of disorders of the ear, nose, and throat.

Representative Exposure - The measurements of an employee's noise dose, or an 8-hour time-weighted average sound level that a qualified person deems representative of the exposure of other employees in that work area or job classification.

Standard Threshold Shift (STS) - An average hearing threshold shift of 10 dB or more at 2,000; 3,000; and 4,000 Hz in either ear. A threshold shift can be temporary or permanent. Temporary threshold shift is a change in hearing threshold, primarily due to exposure to high-intensity noise that is usually recovered in 14 to 72 hours. Any loss that remains after an adequate recovery period is termed permanent threshold shift.

Sound-Pressure Level - The term used to identify a sound measurement (expressed in decibels) obtained with a sound-level meter that has a flat frequency response. This is mathematically equivalent to 20 times the common logarithm of the ratio of the measured A-weighted sound pressure to the standard reference pressure of 20 micropascals (measured in decibels). For use with this standard, slow time response is required in accordance with the current ANSI.S1.4.

Sound-Level Meter (SLM) - An electronic instrument for the measurement of sound levels that conforms to the requirements for a Type II sound-level meter as specified in ANSI S1.4-1971.

Time-Weighted Average (TWA) Sound Level - The sound level that, if constant over an 8-hour workday exposure, would result in the same noise dose as is measured.

TWA (80) - The time-weighted average level that corresponds to a noise dose computed with an 80-dBA cut-off level.

15.3 Responsibilities

Health and Safety Manager

- Develops and implements a hearing conservation program.

- Provides guidance to employees (and their managers) whose jobs expose them to hazardous noise levels.
- Provides periodic noise monitoring when necessary.
- Periodically reviews the hearing conservation program for compliance standards.
- Provides employees access to noise survey/dosimetry records.
- Coordinates the medical surveillance program that includes baseline and annual audiograms.
- Recommends the selection of hearing protection and specifies performance (attenuation) requirements.
- Notifies management of all areas that have been designated as noise hazard areas.

Health and Safety Coordinators

- Reports suspected hazardous noise areas to the HSM so that noise monitoring can be conducted.
- Ensures that employees who work in designated noise hazard areas (or are otherwise exposed to hazardous noise) receive pre-placement, annual, and termination audiograms.
- Ensures that employees in high-noise areas use hearing protection devices.
- Notifies the HSM of any changes in operations that require noise determinations or evaluations.
- Ensures that hearing protection devices that have been approved by the HSM are available for use by employees.
- Ensures that employees who participate in the Hearing Conservation Program attend required training and provides documentation of such training to the HSM.
- Ensures that caution signs are posted in designated noise hazard areas.
- Ensures the design and application of engineering controls recommended by the HSM that are needed to reduce noise exposures to acceptable limits or to the maximum extent feasible.

Employees

Responsibilities of employees who work in high noise areas are:

- Wear and maintain hearing protection as required by the HSC
- Cooperate with H&S personnel in activities undertaken to evaluate hazardous noise

- Notify direct or project manager or HSC of areas, operations, or equipment that may produce hazardous noise
- Attend hearing conservation training when necessary
- Participate in the medical surveillance program

15.4 Noise Exposure Limits

Protection against the effects of noise exposure shall be provided when sound levels exceed those in Tables 15-1 and 15-2 below. Noise exposure limits are generally applied as an 8-hour exposure limit of 85 dBA. For exposures of shorter or longer durations, the exposure limit may be adjusted as indicated in the table. Hearing conservation program elements are expected to be implemented whenever employee noise exposures equal or exceed an 8-hour time-weighted average of 80 dBA measured as per Subsection 15.5.5. Hearing conservation program elements include exposure monitoring, audiometric testing, medical monitoring, and training. The dose criterion of 80 dBA for an 8-hour exposure is referred to as the action level.

Table 15-1
Continuous Noise Permissible Exposure Limits

Duration (Hours)	*Sound Level (dBA)**
16	80
8	85
4	90
2	95
1	100
0.5	105
0.25	110
0.125 or less	115

*Measured on the A-scale of a standard sound-level meter set at slow response.

Table 15-2
Impulse Noise Permissible Exposure Limits

*Sound Level (dBP)**	*Permitted Impulses/Day*
140	100
130	1,000
120	10,000

*Peak sound-pressure level.

15.5 Hearing Protection Methods

15.5.1 Engineering Controls

Where feasible, facilities and equipment will be procured, designed, operated, and/or modified in such a manner as to prevent employee exposure to continuous noise levels above 85 dBA over an 8-hour TWA or impulsive noise above 125 dBP. Any reduction in employee noise exposure, even if not reduced below 85 dBA, is beneficial. If engineering controls fail to reduce sound levels to within the limits of

Section 15, hearing-protective equipment and/or administrative methods of noise-exposure protection must be used.

15.5.2 Personal Hearing Protection

- PPE is to be used only temporarily or if engineering controls are not feasible or practical.
- The HSCs shall enforce the use of earmuffs and/or plugs by employees assigned to work in areas where they will be exposed to continuous noise (without regard to duration of exposure) in excess of 85 dBA or to impulse noise in excess of 140 dB. Disposable earplugs and/or earmuffs will be made available for employee use (if desired) if noise exposures under 85 dBA create a nuisance. Earplugs will be provided for the exclusive use of each employee and will not be traded or shared.
- Hearing protectors must attenuate employee noise exposure to a level of 85 dBA or below. Both earmuffs and plugs are required where noise levels equal or exceed 110 dBA. For employees with standard threshold shift, protectors must attenuate exposure to an 8-hour TWA of 80 dBA. Estimation of the adequacy of hearing-protector attenuation should be performed according to the methods OSHA specifies in 29 CFR 1910.95 App B, Methods for Estimating the Adequacy of Hearing Protector Attenuation.
- If reusable preformed earplugs are used, they will be permanently issued to the employee and fitted to the employee under medical supervision. During fitting, the employee will be instructed in the proper method of insertion, storage, and cleaning of the earplugs. Earplugs will be checked during annual medical examinations.
- Earmuffs will be provided for employees when analysis of noise environments shows that the attenuation provided by earplugs is not sufficient to reduce noise exposures below 85 dBA. The user shall inspect earmuffs on a regular basis.
- Special hearing-protective equipment, such as sound-suppression communication headsets, may be used in noise hazard areas. These devices should be inspected regularly. Sound-suppression headsets may not be used if they have been damaged, altered, or modified in any way that affects the attenuation characteristics. If replacement parts (such as ear cup seals) are available, the headsets may be repaired and reused. If sound-suppression headsets are not permanently issued to employees, such equipment must be cleaned and sanitized before reissuance.

15.5.3 Administrative Controls

If hearing-protective equipment or engineering controls are not sufficient to attenuate noise to less than 85 dBA, the duration of time spent in the noise hazard area shall be limited so as not to exceed the exposure limits specified in Section 15.4.

15.5.4 Noise Monitoring

- Measurement of potentially hazardous sound levels shall be conducted when any information, observation, or calculation suggests that an employee could be exposed to a noise

level in excess of an 8-hour TWA. This includes, but is not limited to, times when representative exposures need to be documented, when employees complain of excessive noise, or when it is difficult to understand a normal conversation if the speaker and the listener face each other at a distance of 2 feet. Any new equipment, operation, job, or procedure with the potential for creating hazardous noise should be evaluated with regard to noise emissions before startup. All continuous, intermittent, and impulsive sound levels from 80 to 130 dBA will be integrated into the noise measurements.

- Both noise dosimetry and area monitoring will be repeated periodically, or whenever any changes to facilities, equipment, work practices, procedures, or noise-control measures alter potential noise exposures.

- Employees and/or their representatives will be provided an opportunity to observe noise dosimetry and area monitoring activities.

- Areas determined to have noise levels at or above 85 dBA must be posted as noise hazard areas.

- Affected employees (employees whose exposures have been determined to exceed the action level) shall be notified of the results of noise monitoring.

15.5.5 Noise-Measurement Methods

- Sound-level meters must meet Type II requirements of ANSI S1.4 and must be capable of measuring sound in the range of 80 to 130 dBA.

- Noise dosimeters must meet Class 2A-90/80-5 requirements of ANSI S1.25 and be capable of integrating sound levels of 80 dB and above.

- Employee noise doses may be ascertained by using either a noise dosimeter or sound-level meter. If a sound-level meter is used to estimate an employee's dose, the noise survey will include a time and motion study to document the variations in the employee's noise exposure during the working shift. If an employee moves about or noise intensity fluctuates over time, noise exposure is more accurately estimated by personal dosimetry. Regardless of the method chosen, a sufficient number of readings/measurements will be made to accurately reflect noise exposure.

- Employee exposure measurements will be made in such a manner as to accurately represent the actual exposure to noise.

  - When using a noise dosimeter to determine an employee's noise exposure, the microphone will be attached to the employee in the area of the employee's shoulder.

  - When using a sound-level meter, the microphone should be positioned not less than 2 inches nor more than 2 feet from the employee's ear.

  - Measurements will be made with the employee at his/her regular work stations(s).

- Before and after each use, dosimeters and sound-level meters will be calibrated using acoustical calibrators to verify the accuracy of the measuring equipment.

  - If any sound-level meter or noise dosimeter is dropped, or if the microphone receives a sharp impact, a calibration check shall be performed to ensure that it is still working properly before taking additional measurements.

  - Sound-level meters and noise dosimeters that are not working properly or are out of calibration shall not be used to determine an employee's noise exposure.

15.6 Medical Surveillance Program

Program Participation

- Whenever an employee is routinely occupationally exposed to continuous noise at or above the action level or to impact or impulsive noise in excess of the limits specified in Section 15.4, the employee shall be enrolled in a medical surveillance program. Employee noise exposure shall be determined without regard to any sound attenuation provided by the use of hearing protectors.

- Each employee placed in a job that required participation in a medical surveillance program shall undergo a physical examination before being assigned to duties that involve exposure to high-intensity noise. The examination shall include a baseline audiogram, a medical examination to determine any preexisting medical pathology of the ear, and a work history to document past noise exposures. The history shall include a detailed review of past work histories and possible occupational and nonoccupational noise exposures.

- When it is discovered that employees have been working where they encounter hazardous noise or incur exposures that exceed the action level and have not had a physical examination, one shall be conducted within 30 days. The audiogram must follow at least 14 hours of no known exposure to sound levels in excess of 80 dBA. This interval should be sufficient to allow recovery from noise-induced temporary threshold shift.

- Personnel who suffer from acute diseases of the ear shall not be placed in hazardous noise areas until the condition has abated, particularly if such diseases preclude the wearing of hearing protectors, cause hearing impairment, or produce tinnitus.

- All employees who are participants in the medical surveillance program must receive an annual audiogram.

- All CDM Smith employees who have participated in the medical surveillance program shall receive a final audiometric examination before termination of employment with CDM Smith, job changes within the installation that would alter noise exposure, transfer to another installation, or retirement.

15.7 Audiometric Testing

15.7.1 Medical Personnel

Medical personnel who perform audiometric tests must be qualified, trained, and knowledgeable in operating equipment used and be under the supervision of an audiologist or physician. If manual audiometers are used, the Council for Accreditation in Occupational Hearing Conservation must certify qualifications of personnel who operate the audiometer. Hearing threshold levels will be determined by audiometers calibrated to zero reference levels of the ANSI S3.6 standard for audiometers.

15.7.2 Pure Tone, Air Conduction Testing

Pure tone, air conduction testing shall be conducted at test frequencies of 500; 1,000; 2,000; 3,000; 4,000; and 6,000 Hz for each ear. Audiometric test equipment shall meet the specification, maintenance, and use requirements of ANSI S3.6. Where a pulsed-tone, self-recording audiometer is used, it will also meet the requirements of 29 CFR 1910.95, Table 3.

- A listening check shall be performed daily before use to ensure that the audiometer is free from distorted or unwanted sounds.

- A functional check shall be performed each day either by using an "acoustical ear" calibrator (dBA sound-level meter with 9A Type Earphone Coupler) or by testing an individual with a known and stable hearing baseline (a "biological check"). A record will be kept of the daily checks. Deviations of 5 dB or more require an acoustical calibration test.

- An acoustical calibration test (using a sound-level meter, octave-band filter set, and a National Bureau of Standards 9A Coupler) shall be performed at least annually (semi-annually for self-recording audiometers), or when a functional check indicates a deviation of 5 dB or more. The acoustical calibration tests shall conform to the requirements of 29 CFR 1910.95, Appendix E. Deviations of 10 dB or more will require an exhaustive calibration.

- An exhaustive calibration shall be performed at least every 2 years, or whenever an acoustical calibration test indicates an error of 10 dB or more. The test will meet the criteria of the current ANSI S3.6 guidelines appropriate for the instrument. Following calibration, the front panel of the audiometer shall be labeled with a tag indicating that is has been calibrated to ANSI S3.6 guidelines and the date of the calibration.

- Rooms used for audiometric testing shall not have background sound-pressure levels that exceed those in the table below. Sound-pressure levels for rooms used for audiometric testing must be checked at least every 2 years.

Table 15-3
Maximum Background Sound-Pressure Levels
for Audiometric Test Booths

Frequency (Hz)	*Sound-Pressure Level (dBA)*
500	27
1,000	30
2,000	35
4,000	42
8,000	45

- Employees must receive advance written notification of the need to avoid high levels of occupational and nonoccupational noise during the 14 hours immediately preceding an audiometric test. Properly fitted hearing protectors and/or other hearing-protective devices may be used to prevent excessive noise exposures during this period.

- A physician or other qualified person shall compare annual audiograms with the employee's baseline audiogram to determine if it is valid and if a standard threshold shift has occurred. It is desirable to review the employee's audiogram record for patterns of change over time. When determining if a standard threshold shift has occurred, allowances for the effects of aging to the hearing threshold level may be made using the procedure described in 29 CFR 1910.95, Appendix F. Audiograms referenced to ASA-1951 must be converted to ANSI S3.6-1969 before hearing threshold levels can be properly determined (see the table below for conversion).

Table 15-4
Threshold Audiogram Conversion
ASA-1951 to ANSI-1969

Frequency	*dB Difference*
250	15
500	15
1,000	10
2,000	10
3,000	10
4,000	5
6,000	10
8,000	10

  - To convert an ASA-1951 reference threshold audiogram to ANSI-1969, add the difference in values.

  - To convert ANSI-1969 to ASA-1951, subtract the values.

- When evaluation of an audiogram indicates that a standard threshold shift has occurred, a retest shall be scheduled within 30 days to determine if the shift is temporary or permanent. A medical evaluation may be warranted at this time to determine if an acute medical condition is a contributing factor.

- An annual audiogram may be substituted for the baseline when, in the judgment of the audiologist, otolaryngologist, or physician who is evaluating the audiogram,

the hearing threshold shown on the annual audiogram indicates significant improvement over the baseline audiogram.

- The employee will be notified of audiometric testing results in writing within 21 days of determination of a permanent threshold sift. The subcontract health care provider retained by CDM Smith shall notify the employer and employee in writing of determinations of permanent threshold shifts.

15.7.3 Criteria for Referral to an Audiologist

The following are criteria for referral to an audiologist for more comprehensive testing:

- Average hearing threshold level greater than 25 dB at 500; 1,000; and 2,000 Hz.
- Single frequency loss greater than 55 dB at 3,000 Hz; or greater than 30 dB at 500; 1,000; or 2,000 Hz.
- Difference in average hearing threshold level between the better and poorer ear of more than 15 dB at 500; 1,000; and 2,000 Hz; or more than 30 dB at 3,000; 4,000; and 6,000 Hz.
- Reduction in hearing threshold level in either ear from the baseline or previous monitoring audiogram of more than 15 dB at 500; 1,000; or 2,000 Hz; or more than 30 dB at 3,000; 4,000; or 6,000 Hz.
- Variable or inconsistent responses or unusual hearing loss curves.

15.7.4 Conditions that Require Follow-Up Review of Employees with Hearing Illness and Responses

- When a permanent threshold shift is detected, a follow-up review must be conducted.
- An employee who is not currently using hearing protection shall be provided (and fitted as necessary) with hearing protectors and shall be trained in their use.
- The employee shall be provided/refitted with hearing protectors that offer greater sound attenuation, as warranted, if hearing protectors are already in use.
- The employee shall be trained/retrained on the hazardous effects of noise and the need to use hearing protection.
- The employee's work area shall be investigated to determine if work practices or changes in equipment or procedures can be made that will decrease noise hazards or if changes have resulted in an increase in noise hazards.
- The employee shall be reassigned to work in a low-noise area, as necessary, to prevent further hearing impairment. The employee will continue to participate in the hearing conservation program.

15.8 Noise Hazard Warning Signs

Caution signs that clearly indicate a hazard of high noise levels and the requirements to wear hearing protection shall be posted at the entrance(s) to, and the periphery of, noise hazard areas. Decals or placards with similar statements shall be affixed to power tools and machines that produce hazardous noise levels. Signs and decals shall have wording in black letters on a yellow background (refer to Section 15.11 for noise hazard warning sign specifications).

15.9 Employee Training

- Each employee who participates in the hearing conservation program shall receive annual training. The training must include, but not be limited to:
  - An overview of the CDM Smith Hearing conservation program
  - A review of the effects of noise on hearing (including permanent hearing loss)
  - Noise control principles
  - The purpose, advantages, disadvantages, and attenuation characteristics of various types of ear protectors
  - Instruction on selection, fitting, use, and care of hearing protectors
  - An explanation of the audiometric testing and its purposes
- Personnel will be encouraged to use hearing protectors when exposed to hazardous noise in nonoccupational settings (e.g., from lawn mowers, firearms, etc.).

15.10 Records Maintenance

- Audiogram and noise-exposure records shall be maintained as a permanent part of employee medical records. If noise-exposure measurement records are representative of the exposures of other employees participating in the hearing conservation program, the range of noise levels and the average noise dose will be made a permanent part of the medical records of the other employee as well.
- In addition to audiometric test data, each medical record will, as a minimum, identify:
  - The audiometric reference level to which the audiometer was calibrated at the time of testing
  - The date of the last calibration of the audiometer
  - The name, social security number, and job classification of the employee tested

- The employee's most recent noise exposure assessment
- The date(s) hearing conservation training was received

- Records of the background sound-pressure levels in the audiometric test rooms and data and information concerning calibration and repair of sound-measuring equipment and audiometers (as well as all audiometric test data) will be maintained by CDM Smith's medical consultant in accordance with OSHA and other applicable regulations.

- Accurate records of noise surveys/monitoring, results of the special noise studies, and records of special actions or engineering controls installed to control noise exposures will be maintained for the duration of the affected employee's employment, plus 30 years.

15.11 Signs and Decals

15.11.1 Noise Hazard Warning Sign Specifications

Warning signs must read:

CAUTION

NOISE AREA

MAY CAUSE HEARING LOSS

USE PROPER

HEARING PROTECTION

IN THIS AREA

The lettering is almost always all caps, black, and on a yellow background.

15.11.2 Noise Hazard Warning Decal Specifications

Decals must have a yellow background and black lettering (all caps). The decal must be self-adhesive on the side opposite the written warning. The written warning must read:

CAUTION

NOISY EQUIPMENT MAY CAUSE HEARING LOSS

USE PROPER

HEARING PROTECTION

The word caution is in yellow lettering with a black background superimposed on the yellow background of the label. As shown, the word caution is 2 point sizes larger than the lettering in the rest of the warning.

16.2 Housekeeping

These guidelines are for the establishment and administration of a clean and orderly work environment at field project sites. A continuous housekeeping program strongly tends to prevent accidents. A clean and orderly work environment can be achieved and maintained through ongoing housekeeping efforts undertaken by personnel at all levels. Project managers shall initiate participation in housekeeping activities and good work habits, not only at the end of a work assignment but throughout the evolution of the project.

- To achieve these benefits, the team shall plan the location of equipment and storage facilities to allow the easy flow of personnel, equipment, materials, fire hazards, and to prevent the obstruction of evacuation, fire fighting, or rescue activities.
- Store materials in a manner that facilitates access of material handling equipment and personnel handling limitations. Lack of sufficient workspace and storage capacity leads to the potential for accidents and decreases efficiency.
- Avoid storage of flammable liquids, such as paints and thinners, unless they are required for specific project needs. If needed, such storage shall be within a metal storage cabinet that has been labeled and approved for the storage of flammable liquids.
- Continuously maintain work areas in a neat and orderly manner.
- Containers should be provided for the collection of waste, trash, and other nonhazardous refuse. Investigation-derived waste and other waste materials that are potentially hazardous should be stored and labeled in accordance with project-specific procedures that meet regulatory and client requirements.
- Deploy leads, hoses, and extension cords so they do not present tripping hazards and are not subject to contact with moisture or physical stress. Where possible, they should be hung overhead with nonconductive material and kept away from walkways, doors, stairs, and ladders.
- Protect protruding rebar and anchor bolts and conspicuously mark them.
- Clean small spills that create slip hazards and/or flammability hazards immediately and do not leave them unattended.
- Keep walkways, aisles, stairways, and passageways in a clear and unobstructed condition.
- Prohibit eating and drinking in work areas where there is potential exposure to toxic or hazardous materials. Smoking is limited to designated smoking areas where there is no such exposure.

16.3 Manual Material Handling

CDM Smith employees should follow the work practices outlined below when lifting and carrying heavy objects.

- Test any load they are required to lift and compare its weight, volume, and shape to their lifting abilities. Employees shall not attempt to lift beyond their capacity.
- Obtain assistance in lifting heavy objects. Back belts or back braces may be used if desired; however, many ergonomists do not believe that these devices create a benefit or provide protection.
- When two or more persons are involved in a manual lift, one person should provide direction of the lift.
- When two or more persons are carrying an object, each employee, if possible, should face the direction in which the object is being carried.
- When two or more persons carry a heavy object that is to be lowered or dropped, there shall be a prearranged signal for releasing the load.
- The right way to lift is easiest and safest. Crouch or squat with the feet close to the object to be lifted, secure good footing, take a firm grip, bend the knees, keep the back vertical, and lift by bending at the knees and using the leg and thigh muscles. Exercise caution when lifting or pulling in an awkward position.
- Employees should avoid twisting or excessive bending when lifting or setting down loads.
- When moving a load horizontally, employees should push the load rather than pull.
- For tasks that require repetitive lifting, the load should be positioned to limit bending and twisting. The use of lift tables, pallets, and mechanical devices should be considered.
- When gripping, grasping, or lifting an object such as a pipe or board, the whole hand and all the fingers should be used. Gripping, grasping, and lifting with just the thumb and index finger should be avoided.

16.6 Compressed Gas Cylinders

CDM Smith employees may occasionally be required to work in industrial, laboratory, or construction work environments where compressed gases are stored or used. In some circumstances, employees may be required to use or handle cylinders directly. Employees that perform work involving compressed gas cylinders should be familiar with their hazards and safe practices.

16.6.1 Identification and Labeling

- All gas cylinders should be clearly labeled with their contents and manufacturer.
  - Do not accept a compressed gas cylinder for use that does not legibly identify its contents by name.
  - Never rely on the color of the cylinder for identification.
- Gas lines leading from a remote compressed gas supply should be labeled to identify the gas, the laboratory or area served, and the relevant emergency telephone numbers.
- Signs should be posted in areas where flammable compressed gases are stored, identifying the substances and appropriate precautions (e.g., HYDROGEN - FLAMMABLE GAS - NO SMOKING - NO OPEN FLAMES).

16.6.2 Engineering Controls / Design Considerations

- Keep hazardous gas cylinders in gas cylinder cabinets or racks, with the exception of cylinders containing a nontoxic flammable gas and cylinders used in fume hood applications. Those must be firmly braced to prevent falling.
- Place a smoke detector adjacent to flammable gas cylinders, connected if possible to the building alarm system. If possible, interlock smoke detector activation with the shutdown of hazardous gas flow.
- Connect all ducts used to exhaust hazardous compressed gas cylinders or gas-carrying components to a source of exhaust ventilation.
- Place a safety shower or eyewash with a shower wand in areas where corrosive gases are used or stored.
- Make sure that all gas piping is compatible with the gases used and capable of withstanding full cylinder pressure.
- Never lubricate, modify, force, or tamper with a cylinder valve. Use the appropriate regulator on each gas cylinder.
- Use check valves when there is the possibility of backflow into the cylinder.

16.6.3 Using Cylinders

- Always use safety glasses with side shields when handling and using compressed gases, especially when connecting and disconnecting compressed gas regulators and lines.
- Never use a cylinder that cannot be identified positively.
- Never use a cylinder of compressed gas without a pressure-reducing regulator attached to the cylinder valve.
- Use regulators and pressure gauges only with gases and pressure ratings for which they are designed and intended.
- Do not use oil or grease as a lubricant on valves or attachments to oxygen cylinders.
- Never use oxygen as a substitute for compressed air.
- Test cylinders with toxic, corrosive, and pyrophoric gases for possible leaks when receiving, installing, disconnecting, or shipping. Always close the cylinder valve before attempting to stop leaks between the cylinder and regulator.
- Damaged or leaking cylinders should be removed from service and tagged as "DAMAGED or DEFECTIVE."

16.6.4 Storing Cylinders

- Keep cylinders in storage upright, secure, and locked into a compact group.
- Cylinders containing the same gas shall be stored in a segregated group; empty cylinders shall be stored in the same manner.
- Properly secure cylinders with chain, rope, or brackets to prevent falling. Valve protection caps must be fully screwed on unless the container is in active service.
- Protect cylinders stored outside from standing water by providing proper drainage. Where outdoor storage is necessary, an overhead cover is required to avoid rain damage and overheating in sunlight.
- For short-term experiments using hazardous gases, select the smallest cylinder available.
- Return corrosive gas cylinders to the gas supplier within 1 year to avoid regulator and cylinder valve problems due to corrosion.
- Some small cylinders, such as lecture bottles and cylinders of highly toxic gases, are not fitted with rupture devices and may explode if exposed to high temperatures. Use and store these with great care.
- Never place cylinders where they may become part of an electric circuit.

- Avoid areas that are damp or subject to other corrosive materials.
- Do not store flammables, toxic gases, and oxidizers adjacent to each other. Store cylinders in well ventilated locations.
- Areas containing hazardous gas in storage must be appropriately placarded.
- Cylinders in storage must be separated from flammable or combustible liquids and from easily ignitable materials (such as wood, paper, packaging materials, oil, and grease) by at least 40 feet (12 meters) or by fire-resistant partition having at least a 1-hour rating.
- Maintain at least a 20-foot separation between fuel and oxygen cylinders, or install a firewall a minimum of 5 feet high with a 30-minute fire rating.
- Empty cylinders must be closed and the valve cap secured. They must be clearly tagged or marked as MT or EMPTY.

16.6.5 Transporting Cylinders

- Never transport a cylinder with a regulator attached.
- Cylinders larger than lecture-bottle size should be chained or strapped to a wheeled cart during transport to ensure stability.
- Only trained personnel using approved trucks may transport cylinders.
- To protect the valve during transportation, the cover cap should be screwed on hand tight and remain on until the cylinder is in place and ready for use.
- Handle only one cylinder at a time.
- Secure cylinders in a basket or similar device when moving them using a crane or derrick. Do not use slings, ropes, or electromagnets for lifting cylinders. Do not allow cylinders to strike each other.

16.6.6 Piping Incompatibilities and Restrictions

- Do not use copper piping for acetylene.
- Do not use plastic piping in any portion of a high-pressure system.
- Do not use cast iron pipe for chlorine.
- Do not conceal distribution lines where a high concentration of a leaking hazardous gas can build up and cause an accident.
- Distribution lines and their outlets must be clearly labeled as to the type of gas contained.

- Piping systems should be inspected for leaks on a regular basis, preferably weekly. Special attention should be given to fittings.

16.6.7 Emergency Procedures

- Do not remove leaking cylinders from their ventilated enclosures until the leakage has stopped.
- Trip the remote emergency gas shutoff valve/button, if present.
- Close the main cylinder valve to stop or slow the leak. The hazardous gases should be contained in their enclosure until it is clearly safe to approach.
- Do not extinguish a flame involving a combustible gas until the source of gas has been shut off.

16.6.8 Training

Employees that handle or use compressed gases need the following training:

- Safe handling practices for hazardous substances contained in gas cylinders: corrosive, explosive, toxic, etc.
- Identification and signs
- Storage and transportation requirements
- Emergency procedures

16.7 Fall Protection

CDM Smith employees who visit active construction sites may be exposed to falls. A fall exposure is considered to exist when an employee is within 6 lateral feet of a change in elevation of 6 vertical feet or more. Typical exposures can include:

- Excavations
- Roofs
- Leading edge of a surface (floor)
- Floor openings

All employees should use fall protection 100 percent of the time when exposed to a fall in excess of 6 feet or when required by rules such as those of a client or the owner or operator of a facility. Fall protection may consist of any of the following:

- Guardrails
- Safety nets
- Positioning systems
- Warning systems
- Personal fall arrest systems

Employees should not use fall arrest equipment until they have been properly trained. Fall protection training can be arranged by contacting your division HSM. Project managers and site managers shall ensure fall protection is available and used as required for all employees for whom they are responsible and that employees receive adequate training in the use of the equipment.

The following work practices and guidelines should be considered for protection against falls:

- Before working or walking on a surface, consider the strength and structural integrity of the surface. Can it support employees and any needed equipment or material safely? Employees shall work on those surfaces only when the surfaces have the requisite strength and structural integrity.

- When not protected by any other means of fall protection, such as safety nets or scaffold with proper guardrails, employees shall use full body harnesses, lanyards with double-locking snap hooks, and an adequate anchorage (fall arrest equipment). To achieve 100 percent fall protection, employees may need to use a two-lanyard system and/or vertical or horizontal lifelines, retractable lifelines, or other approved positioning devices.

- Employees shall rig fall arrest equipment so that it minimizes the potential for a fall arrest event or any potential free-fall, lateral swing, or contact with any lower object. Under no circumstances shall fall arrest equipment be rigged so that an employee can free-fall more than 6 feet.

- Anchorage points for fall arrest equipment shall be capable of supporting 5,000 pounds per employee attached. Anchorage points for fall arrest equipment shall be located above the employee's body harness attachment point where practical.

- When vertical lifelines are used, a separate lifeline shall protect each employee. The lifeline shall be properly weighted at the bottom and terminated to preclude a device such as a rope grab from falling off the line.

- Horizontal lifelines should be limited to two persons at one time between supports and maintain a safety factor (strength/requirement) of at least 2.

- Before each use, employees shall visually inspect all fall arrest equipment for cuts, cracks, tears or abrasions, undue stretching, overall deterioration, mildew, operational defects, heat damage, or acid or other corrosion. Equipment showing any defect shall be withdrawn from service. All fall arrest equipment subjected to impacts caused by a free-fall or by testing shall be removed from service. CDM Smith personnel shall use full body harnesses for personal fall protection. Fall protection equipment is available from the field equipment centers.

- Fall arrest equipment should be stored in a cool dry place not subjected to direct sunlight.

- Fall arrest equipment shall not be used for any other purpose, such as towropes or hoist lines.

- Proper guardrails shall be installed on open sides of all walkways and runways where the fall distance exceeds 4 feet. Proper guardrails shall be installed on open sided floors where the fall distance exceeds 6 feet. All floor openings or floor holes shall be protected by guardrails or hole covers. If hole covers are used, they shall be strong enough to support the maximum intended load, secured against displacement, and properly labeled.

- When guardrails are used for fall protection, they shall consist of a top rail, intermediate rail, and toeboard. The top rail shall have a vertical height of 42 inches, the midrail shall be at 21 inches, and the toeboard 4 inches. When wood railings are used, the post shall be of at least 2-inch by 4-inch stock spaced not to exceed 8 feet, the top rail shall be of at least 2-inch by 4-inch stock, and the intermediate rail shall be of at least 1-inch by 6-inch stock. If pipe is used, it shall be at least 1½-inch nominal diameter. If structural steel is used, it shall be of 2-inch by 2-inch by 3/8-inch angles or equivalent. If wire rope is used for railings, it shall have a diameter of at least 2 inches and shall be stretched taut to allow no more than a 3-inch deflection.

- When operating a scissor-lift work platform, the lift shall have guardrails on all open sides, with the door access chains or rails in place.

- Employees operating aerial lifts shall wear a body harness and lanyard attached to the aerial lift. Employees shall not attach the lanyard to an independent structure.

- Employees riding in a crane-suspended work platform shall wear a body harness and lanyard attached to the grab rail of the platform.
- Employees working on or near wall forms or rebar shall wear a body harness lanyard and/or positioning device when exposed to a fall in excess of 6 feet.
- Positioning devices shall be rigged to prevent a free-fall greater than 24 inches.
- Stairs, ladders, or ramps shall be provided for all access ways where there is a change in elevation greater than 19 inches.
- Manila or synthetic rope shall not be used as guardrails.
- Employees shall not stand or sit on guardrails.
- Personal fall arrest systems shall not be attached to guardrail systems.
- If warning lines are used, they should consist of rope, wire, or chain and be flagged at intervals of 6 feet or less with high-visibility material. The lowest point should be no less and 34 inches from the surface, and the highest point should be no more than 39 inches. The warning line should be placed at least 6 feet from the edge.
- Safety net systems should be installed as close to the working surface as practical, but in no case more than 25 feet below the working surface and should extend outward at least 8 to 13 feet depending on the vertical fall distance. Safety nets should be drop-tested after initial installation and at 6-month intervals. The maximum size of net mesh should not exceed 36 square inches nor be longer than 6 inches on any side. Mesh opening should be secure to prevent enlargement.
- Body belts should not be used for personal fall arrest. Full body harnesses are required.

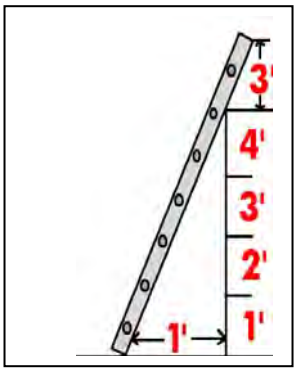
16.9 Ladders

The following guidelines should be followed by CDM Smith employees when using ladders.

16.9.1 Portable Ladders

- Ladders should be used to travel from one elevation to another. Except where it is not feasible, work should not be performed from ladders. When it is necessary to perform work at high elevation, scaffolds or mobile lift equipment should be used.
- If it is necessary to work from a ladder:
  - The ladder must be secured to prevent it from slipping or falling.
  - When possible, employees working more than 6 feet above grade should wear a body harness and lanyard and tie off to a secure anchor, (n**ot the ladder!**) or have another employee hold the ladder.
- Before using any ladder it should be inspected. Look for:
  - Missing non-skid feet.
  - Worn or frayed ropes.
  - Cracks in sides or rungs.
  - Missing rivets or other fasteners.
  - Bent or missing spreaders.
  - Bowed or distorted members.
  - Loose rungs.
  - Any condition that could cause a safety problem.
  - Ladders that have fallen or been misused should be checked for excessive dents or damage.
  - Ensure that tie-off rope is attached and in good condition.
  - Ensure that the spreaders and locking mechanisms on stepladders are in good condition.
  - Ensure that hinges move easily and are in good condition.
- Ladders should not be painted. Paint can hide damage and defects.
- Select the correct type of ladder for the job. Only fiberglass ladders should be used at electricity-generating facilities. Only nonconductive ladders should be used for work involving electricity or the use of electrically powered tools. Make sure the ladder is long enough to reach the desired point without compromising recommended safe-use procedures.
- Secure ladders by tying the top or bottom to a fixed structure that will support more than the anticipated total load. Maintain an adequate slope with the base at least one quarter of the length of the ladder away from the supporting structure.

- The ladder should extend 3 feet above any landing you will access.



- Do not leave unattended step or straight ladders standing. They should be closed, lowered to the ground, and placed where they do not present tripping hazards.
- Keep the area around the base and top of the ladder free of tripping hazards, and barricade the area if the base or top projects into a passageway.
- When either the length or the weight of a ladder makes it difficult to handle, two people should raise and secure the ladder. One should secure the feet while the other walks under the ladder from the opposite end until it is raised enough to place or move. Raise the extension, if needed. Reverse the process for lowering the ladder.
- Extension ladders must be equipped with necessary irons, locks, and hooks and assembled so the sliding (upper) section is on top of the base (lower) section. In addition, extension ladder sections should overlap at least 3 feet. If the ladder extends more than 4 feet above the top tie-off, place a barrier or flag on the ladder to prevent personnel from climbing beyond a safe point.
- Ensure that shoes/boots are free of mud, oil, or grease before ascending or descending a ladder. Ladder rungs must be cleaned immediately if they become soiled to reduce slipping hazards.
- Employees should use a tool pouch or bucket-and-line to raise or lower materials, rather than carrying them while ascending or descending a ladder.
- Only one employee may climb or descend a ladder at a time.
- When climbing or descending a ladder, face the ladder and maintain three points of contact at all times. (i.e., two feet and one hand, two hands and one foot.)
- Straight ladders should not be climbed beyond the third step from the top.
- Excavations and trenches more than 4 feet deep should have a ladder (or ladders) that extends at least 3 feet above the ground surface placed so that personnel will not travel more than 25 feet horizontally to get to a ladder.
- When storing ladders, take the following precautions:
  - Ladders stored horizontally should have support in a sufficient number of places to prevent sagging and permanent set.
  - Tie together or secure ladders that are stored vertically to keep them from falling into aisles or equipment.

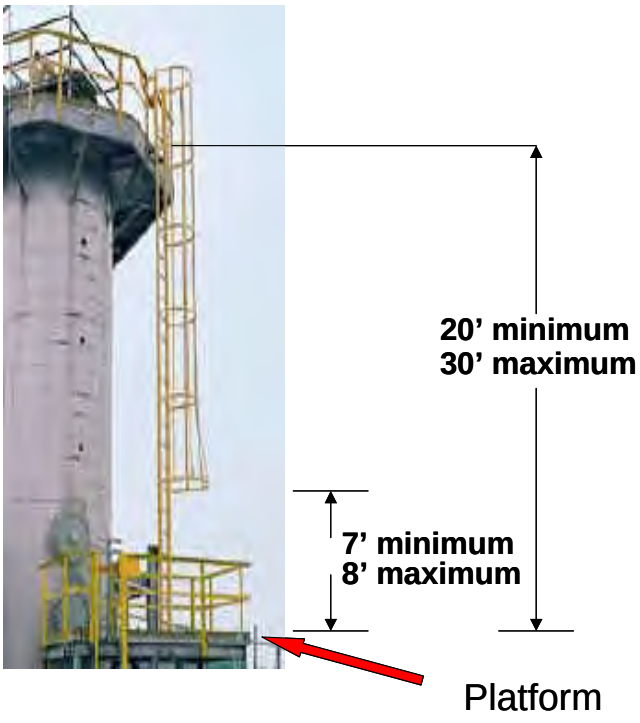
- Do not store wooden ladders near radiators, stoves, or other heat sources that could dry the wood and cause deterioration.
- Do not store wooden ladders near steam lines or other places where they are kept wet or damp enough to rot wood.
- Clean ladders after every use before returning them to storage. Remove all mud, oil, and grease.

16.9.2 Stepladders

- Stepladder legs should be fully spread with the spreader bars locked in place.
- Stepladders should not be used as straight ladders.
- The top two steps should not be used.
- Do not leave tools or materials on the top shelf of a stepladder, remove them before descending a ladder and/or moving it.

16.9.3 Fixed Ladders

- Fixed ladders more than 20 feet high must be caged unless other fall prevention safety devices are installed and used. Fixed ladders with cages exceeding 20 feet in height shall have landing platforms installed every 30 feet. Use of the body harness and lanyard described in Section 16.9.1 would meet this requirement.
- Fixed ladders should be securely attached to an immobile structure and attachments should be inspected annually for signs of deterioration or detachment. Repairs must be made immediately.



16.12 Tools and Power Equipment

16.12.1 Hand Tools

CDM Smith employees who have a need to use basic hand tools should use the following work practices:

- All tools used on CDM Smith projects, regardless of ownership, shall be of an approved type and maintained in good condition. Tools are subject to inspection at any time. The project manager has the authority and responsibility to condemn unserviceable tools, regardless of ownership.
- Tag defective tools to prevent their use or removal from the job site.
- Use the proper tool for the job performed.
- Do not use hammers with metal handles, screwdrivers, knives with metal continuing through the handle, and metallic measuring tapes on or near energized electrical circuits or equipment.
- Do not throw tools from place to place or from person to person. Tools that must be raised or lowered from one elevation to another shall be placed in tool buckets or firmly attached to hand lines.
- Do not place tools unsecured on elevated places.
- Dress, repair, or replace all impact tools such as chisels, punches, drift pins, etc., that become mushroomed or cracked before further use.
- Use suitable holders or tongs, not the hands, to hold chisels, drills, punches, ground rods, or pipes that are struck by another employee.
- Do not use shims to make a wrench fit.
- Do not use wrenches with sprung or damaged jaws.
- Do not use pipe or other means to extend a wrench handle for added leverage unless the wrench was designed for such use.
- Use tools only for the purposes for which they have been designed.
- Store and handle tools with sharp edges so that they will not cause injury or damage. They shall not be carried in pockets.
- Use eye protection when using or working around impact type tools (e.g., hammer, chisel, ax, hatchet, etc.).
- Replace wooden handles that are loose, cracked, or splintered. The handle shall not be taped, glued, or lashed with wire.

- Keep all cutting tools such as saws, wood chisels, knives, or axes in suitable guards or in special compartments.

- When using such tools as screwdrivers and wrenches, avoid using your wrists in a bent, flexed, extended, or twisted position for long periods of time. Employees should maintain their wrists in a neutral or straight position.

- Do not leave tools lying around where they may cause a person to trip or stumble.

- When working on or above open grating, use a canvas or other suitable covering to cover the grating to prevent tools or parts from dropping to a lower level where others are present, or barricade or guard the danger area.

- Do not depend on the insulation on hand tools to protect users from shock.

16.12.2 Electric Tools

CDM Smith employees who have a need to use electric power tools should use the following work practices:

- The non-current carrying metal parts of portable electric tools such as drills, saws, and grinders shall be effectively grounded when connected to a power source unless the tool is an approved double-insulated type or the tool is connected to the power supply by means of an isolating transformer or other isolated power supply, such as a 24-volt DC system.

- All power tools shall be examined before use to ensure general serviceability and the presence of all applicable safety devices. The electric cord and components shall be given a thorough examination for cracks, exposed wires, or other defects.

- Power tools shall be used only within their capability and shall be operated in accordance with the manufacturers' instructions.

- The use of eye protection is required when using or working around power tools.

- Operators should take care to use appropriate hand positions on cutting tools such as saws, drills, or grinders to avoid hand injury.

- All tools shall be kept in good repair and disconnected from the power source while repairs are being made.

- Electrical tools shall not be used where there is a hazard of flammable vapors, gases, or dusts until that hazard is firmly under control.

- GFCI should be used with all electric power tools.

- All guards and safety interlocks with which the tools were purchased shall be in place and in working order.

- Any tool that is identified as defective should be tagged "not for use," and set aside for repair and/or discarded.
- Do not wear loose or frayed clothing while operating power tools and equipment. Hair should not stick out from hard hats.
- Do not use electrical cords to transport, suspend, hoist, or lower tools.
- Do not allow power cords to lie in water.
- Disconnect rotating tools from the power source before adjusting, servicing, or cleaning them. Follow the lockout procedure described in Section 16.5.
- Do not modify tools.

16.12.3 Pneumatic Tools

CDM Smith employees that use pneumatic power tools should use the following work practices:

- Compressed air and compressed air tools shall be used with caution.
- Pneumatic tools shall never be pointed at another person.
- Pneumatic hose connections should be secured by some positive means to prevent them from becoming accidentally disconnected. Chicago fittings have wire holes to allow such security.
- Pneumatic power tools shall be secured to the hose by some positive means to prevent the tool from becoming accidentally disconnected.
- Safety clips or retainers shall be securely installed and maintained on pneumatic impact tools to prevent attachments from being accidentally expelled.
- Compressed air shall not be used for cleaning purposes except when reduced to less than 30 psi and then only with effective chip guarding and PPE.
- Compressed air shall not be used to blow dust or dirt from clothing (or skin).
- The manufacturer's safe operating pressure for hoses, pipes, valves, filters, and other fittings shall not be exceeded.
- The use of hoses for hoisting or lowering tools shall not be permitted.
- All compressed air hoses exceeding 30 psi shall have a safety device at the source of supply or branch line to reduce pressure in case of hose failure or disengagement of a connection.

- Before making adjustments or changing air tools, the air shall be shut off at the air supply valve ahead of the hose. The hose shall be bled at the tool before breaking the connection. Disconnection at the quick-change connectors is one way to meet this goal.
- Eye protection is required when using or working around pneumatic tools.
- Use hearing protection if noise exposure is a concern (i.e., if it is too loud to conduct a normal conversation).
- Pneumatic tools shall be operated only by persons trained in their use.
- A pneumatic tool used where it may contact exposed live electrical parts shall have a nonconductive hose and an accumulator to collect moisture.
- Employees shall not use any part of their bodies to locate or attempt to stop an air leak.
- All guards and safety interlocks must be in place and functional.

16.12.4 Engine-Powered Tools

CDM Smith employees that use engine-powered tools should use the following work practices:

- Stop the engine and allow it to cool before refueling, servicing, or maintenance.
- Use care in refueling. Clean up any small spills of fuel or oil immediately.
- The use of eye protection is required when using or working around engine-powered tools.
- Use hearing protection if noise exposure is a concern (i.e., if it is too loud to conduct a normal conversation).
- If possible, disconnect the spark plug before performing an adjustment, maintenance, or service.
- Use tools in well ventilated areas to eliminate any accumulation of fumes.
- Do not use tools in a flammable or explosive atmosphere.
- Equip engines with spark-arresting mufflers.
- Avoid contact with hot engine components.
- All guards and safety interlocks should be in place and functional.

16.13 Heat Stress

CDM Smith employees may be exposed to hazards associated with hot work environments. Factors that contribute to heat exposure include temperature, humidity, PPE radiant heat, sunlight, access to drinking water, exposure duration, and work activity. Individuals vary widely in their susceptibility to heat stress. Factors that may influence individual susceptibility to heat stress include the following:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

The following guidelines should be considered when CDM Smith employees or subcontractors perform work:

- In ambient air temperatures above 80°F
- That involves heavy physical labor in temperatures above 70°F
- In chemical-protective clothing above 70°F

16.13.1 Hazards Associated with Heat Stress

Heat Stroke – Heat stroke is a serious medical emergency and can lead to death if left untreated. It is an acute and dangerous reaction caused by the failure of heat regulating mechanisms of the body. Persons who are elderly, obese, chronically ill, alcoholic, diabetic, or have circulatory system problems are at greater risk.

- Symptoms include red, hot, dry skin; nausea; headache; weakness; dizziness; elevated body temperature (BT); rapid respiration and pulse; coma; or loss of consciousness.

- Treatment for heat stroke:

  - Heat stroke is a serious medical emergency. Emergency medical services (911) should be contacted if heat stroke is suspected.
  - Move the victim to a cool place (shade, air conditioned building, vehicle).
  - Remove heavy clothing.
  - Cool the victim with ice packs, wet towels, or cloth.
  - Keep head and shoulders elevated.
  - Keep victim's airway open, check breathing and pulse.

Heat Exhaustion – A state of exhaustion or weakness caused by loss of fluids through perspiration and inadequate fluid replacement. Severe cases may result in loss of consciousness (fainting). This condition can progress to heat stroke if left untreated.

- Symptoms include:

  - Pale, clammy, moist skin; heavy sweating; and extreme weakness.
  - BT is normal, pulse is weak and rapid, breathing is shallow.

- The person may have a headache, nausea, or feel dizzy.

- Treatment for heat exhaustion:

  - Remove the victim to a cool location (shade, air conditioned building, or vehicle).
  - Allow the victim to lie down and prop their legs up.
  - Cool the victim with wet towels, cloth, or cold packs.
  - If the victim in not nauseous, they should drink water slowly.
  - If the victim loses consciousness, transport to local medical facility.
  - Continue treatment until symptoms are gone. Consult with CDM Smith medical consultant before returning to work.

Heat Cramps – Heat cramps are a condition that can progress to heat exhaustion or heat stroke. Symptoms include severe cramping of the arms, legs, and abdomen. Treatment includes:

- Removing the victim to a cool location; loosen clothing
- Having the victim slowly drink cool water
- Resting the cramping muscles

Heat Rash – Heat rash is a mild red skin rash in areas where the body is in contact with clothing or protective gear. The area is likely to itch and can be a source of irritation. Treatment includes decreasing the amount of time in protective gear and applying talcum powder to absorb moisture. When possible, wear breathable clothing to prevent a buildup of moisture within the clothing.

16.13.2 Heat Stress Monitoring

Since the susceptibility to heat stress hazards can vary greatly from one individual to another, often the best way to monitor for heat stress is through observing employees and individual physiological monitoring. When working in conditions that have the potential to create heat stress, either heart rate (HR) or BT should be monitored in accordance with the suggested frequency given in Table 16-1 below:

Table 16-1
Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers[a]

Adjusted Temperature[b]	*Normal Work Ensemble[c]*	*Impermeable Ensemble*
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5° to 90°F (30.8° to 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5° to 87.5°F (28.1° to 30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5° to 82.5°F (25.3° to 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5° to 77.5°F (22.5° to 25.3°C)	After each 150 minutes of work	After each 120 minutes of work

[a] For work levels of 250 kilocalories/hour.

[b] Calculate the adjusted air temperature (T_a adj) by using this equation: T_a adj °F = T_a °F + (13 X % sunshine). Measure air temperature (T_a) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow (100 percent sunshine - no cloud cover and a sharp, distinct shadow; 0 percent sunshine - no shadows).

[c] A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

- Heart Rate – HR should be measured by the radial pulse for 30 seconds as early as possible in the initial rest period. On an individual basis, if the HR exceeds 110 beats per minute (BPM), that individual should not return to work until their HR drops below 110 BPM and they are fully recovered. If more than one worker has an HR that exceeds 110 BPM, a work rest regimen or other control measures should be implemented to maintain HRs below 110 BPM.

- Body Temperature – The BT may be measured using a clinical oral thermometer or a clinical ear thermometer. On an individual basis, if the BT exceeds 99.6°F, that individual should not return to work until their BT drops below 99.6°F and they are fully recovered. If more than one worker has a BT in excess of 99.6°F, a work rest regimen or other control measures should be implemented to maintain BTs below 99.6°F.

- Personnel should monitor themselves and each other for the development of symptoms such as sudden fatigue, nausea, dizziness, irritability, malaise, flu-like symptoms, and lightheadedness.

16.13.3 Heat Stress Controls and Prevention

- Develop work/rest regimen to maintain physiological parameters within limits described above and prevent development of initial symptoms of heat stress related conditions. If the physiological limits are exceeded or symptoms develop, the work period should be reduced and rest period increased. Rest areas should be cool (in areas such as shade, air conditioned buildings, or vehicles) and away from heat exposure.

- In extreme heat conditions, employees may wear heat-control clothing such as ice vests or cool suits. Physiological monitoring should still be conducted and work/rest regimens implemented to keep physiological parameters within recommended limits.

- Mobile showers or hoses can be used to cool down workers in waterproof protective clothing.

- Shield sources of radiant heat.

- Provide shaded work areas.

- Conduct activities in early morning and late evening to avoid the hottest parts of the day.

- Allow employees to become acclimatized to the heat by performing less strenuous activities for the first few days. Schedule more physically demanding work later.

- Provide adequate, cool drinking water for consumption during break periods.

- Avoid consumption of beverages such as coffee, tea, or colas that act as diuretics and dehydrate the body.

16.15 Working Around Heavy Equipment

Good work practices while working around heavy equipment include:

- Assume the operator cannot see you. The operator's vision may be blocked by blind spots. He or she is frequently concentrating on their work and equipment and may not notice a site visitor.
- If you must approach the operator, be sure you have made eye contact with the operator and they know you will be approaching them before approaching the equipment. Verbal contact, direct or by radio, is even better. Do not approach if the equipment is moving or in operation.
- Stay clear of pinch points and swing areas of equipment. At CDM Smith projects, these areas should be taped or barricaded off; however, when equipment moves frequently, you cannot count on other organizations to mark these zones.
- Do not walk near a moving piece of equipment. It could turn or rotate any minute. Modern construction equipment moves fast and in any direction.
- On a noisy site, you may not notice the equipment's back-up alarm. Keep aware of what is happening around you.
- Never walk under a load on a crane or hoist. Indeed, avoid the area under the hook or bucket.
- Do not cut across the path of equipment backing up.
- Wear your hardhat and safety glasses. The safety glasses protect your eyes from dust and debris and the hardhat provides protection for your head and makes you more visible on the site.
- On sites where there is frequent vehicle or construction equipment movement, wear high-visibility clothing.
- Maintain a clearance of at least 10 feet between any part of the machine or its load and any electrical line or apparatus carrying up to 50,000 volts. One foot of additional clearance is required for every additional 30,000 volts.

16.17 Flammable and Combustible Liquids

Work with flammable or combustible liquids exposes the employees to fire, explosion, and toxicity hazards. They should implement the following controls.

16.17.1 Storage and Handling

- Only approved containers and portable tanks should be used for the storage and handling of flammable and combustible liquids.
  - Approved safety cans shall be used for the handling and use of flammable liquids in quantities greater than 1 gallon.
  - For quantities of 1 gallon or less, only the original container or approved safety cans shall be used for storage, use, and handling of flammable/combustible liquids.
  - The requirements for shipping these liquids exceeds those described here. If flammable or combustible liquids must be shipped, the individual offering the material for shipment must have completed DOT Hazardous Material Training. Contact your HSM for information on DOT training.
- Flammable or combustible liquids shall not be stored near exits, stairways, or pathways that people normally use for safe passage.
- No more than 25 gallons of flammable/combustible liquids shall be stored in a room outside of a storage cabinet or tank approved for the purpose.
- Quantities of flammable and combustible liquids in excess of 25 gallons shall be stored in an acceptable or approved cabinet meeting the requirements of 29 CFR 1926.152(b)(2)(i).
- Cabinets shall be labeled in conspicuous lettering, “Flammable - Keep Fire Away.”
- Not more than 60 gallons of flammable or 120 gallons of combustible liquids shall be stored in any one storage cabinet. Not more than three cabinets may be located in a single storage area.

16.17.2 Outdoor Storage

- For storage of flammable and combustible liquids outdoors, containers (not more than 60 gallons each) shall not exceed 1,100 gallons in any one pile or area. Five feet of clearance shall separate piles or groups of containers. These containers shall remain at least 20 feet from any other building or structure.
- Within 200 feet of each pile of containers, there shall be a 12-foot wide access way to permit approach of fire control apparatus.

- The storage area shall be graded in a manner to divert possible spills away from buildings or other exposures, or shall be surrounded by a curb or earth dike at least 12 inches high. Provisions shall be made for the controlled draining of accumulations of groundwater or rainwater, or spills of flammable or combustible liquids when curbs or dikes are used.

- At least one portable fire extinguisher, having a rating of not less than 20 pounds, shall be located not less than 25 feet or more than 75 feet from any flammable or combustible liquid storage area located outdoors.

- Precautions shall be taken to prevent the ignition of flammable/combustible vapors. Sources of ignition include, but are not limited to: open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static, electrical, and mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat.

16.17.3 Dispensing Flammable and Combustible Liquids

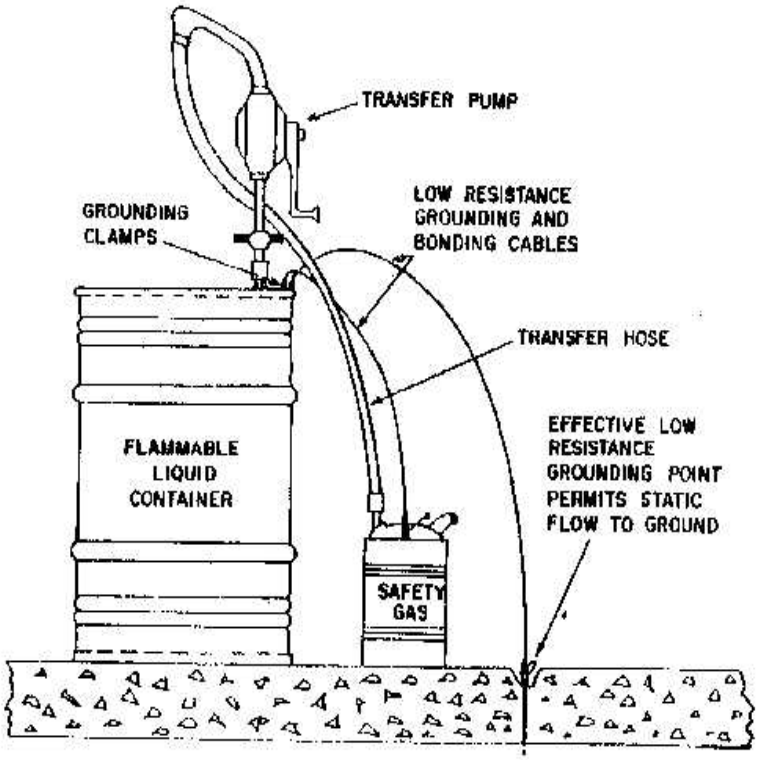
- Areas where flammable or combustible liquids are dispensed at one time, in quantities greater than 5 gallons from one tank or container to another tank or container, shall be separated from other operations by a distance of 25 feet or by construction having a fire resistance of at least 1 hour. Adequate natural or mechanical ventilation shall be provided to maintain the concentration of flammable/combustible vapor at or below 10 percent of the LEL.

- Static electricity is generated by the contact and separation of dissimilar material, such as when fluid flows through a pipe or from an orifice into a tank. If the accumulation of static charge is sufficient, a static spark may occur. Transfer of flammable/combustible liquids from one container to another should be done only when containers are electrically bonded and grounded to prevent such accumulation of static charge (Figure 16-3).

- The management of flammable and combustible liquids is much more complicated than is indicated by the length of this section, which reviews only those issues appropriate to the incidental use of these materials.

- Storage and handling of the mobile and combustible liquids should comply with the requirements of National Fire Code No. 30 (see http://www.nfpa.org/Codes/NFPA_Codes_and_Standards/List_of_NFPA_documents/NFPA_30.asp – you will need a password from the CDM Smith Infocenter).

Figure 16-1
Typical Grounding System



16.18 Safety Working Around Drill Rigs

The use of mechanical drill rigs to collect soil samples and install monitoring wells presents significant hazards to operators and helpers, as well as technicians and engineers who may work in proximity to such rigs. CDM Smith employees that manage or oversee drilling operations should be aware of the basic hazards of drilling equipment and operations and have an awareness of safe drilling work practices. The guidelines and work practices described below should be implemented on all projects where mechanical drill rigs are used.

16.18.1 Preparation

- Contract documentation with drillers contracted with CDM Smith should include CDM Smith's standard contract between "Engineer & Subcontractor for Drilling Services," and "Health and Safety Protocol for Subcontractors" available on the Office of General Council's page of contract forms at http://cdmweb/legalforms/inc.htm.

- Before drilling or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities, unexploded ordnance, tanks, pipes, or other underground structures. The local agency or organization for utility location should be contacted to identify underground utilities. In some cases, ground penetrating radar or magnetometer studies may be needed to identify the location of underground obstructions.

- The work area for the drill rig and crew should be cleared of sticks, logs, brush, and trash. Inspect the area for any potential tripping hazards and remove them. If they cannot be removed, they should be identified with caution tape or cones.

- Before rig setup, the planned arrangement of equipment should be such that it does not present a dangerous condition. Take into account slopes of hills, mud, standing water, overhead power lines, etc.

- OSHA regulations require that any part of the rig must be at least 10 feet away from power lines under 50kV or less. For higher voltage lines, 1 foot of additional clearance is required for every additional 30,000 volts.

- If working in an area of moving vehicular traffic, appropriate traffic control systems should be in place. Contact local police or traffic control officer, before placing any traffic control equipment (Section 16.22).

- Define an exclusion zone around the drill rig that is at least 1.5 times the height of the mast. Only personnel necessary for the immediate task being performed should be inside the exclusion zone.

16.18.2 Drill Rig Inspection

- After the rig is set up, but before operation, the work area should be inspected for eye, bump, and tripping hazards.
- The driller should inspect the rig daily before operation of the rig. The inspection should include the following:
    - Condition of the vehicle. Brakes should work and tires should have adequate tread. It should have a back-up alarm. If it is driven over the road, it should have all necessary brake lights, headlights, horn, license plates, etc.
    - All welds should be solid, with no sign of visible cracks.
    - All gauges should be functional and legible.
    - All machine guards should be in place.
    - Emergency kill switches should be functional. All site personnel should be aware of the location and function of the kill switches. Have the driller review these with site personnel.
    - Cable and wire rope should be inspected for fraying, decay, "bird caging," broken strands, kinking, or flattening.
    - All hoses should be secure and in good shape. They should not be loose, bulging, or leaking.
    - High-pressure fittings should be secure and have whip checks (a pin or wire to prevent the hose whipping in the event of a failure of the connection).
    - High-pressure relief valves should be in working order.
    - Wire rope loops should be secure with at least two clamps.
    - The rig should have a fire extinguisher and first aid kit.
    - All tools should be clean and in good working condition. Hooks, eyes, pins, etc. should not be corroded or bent. Rod clamps should be in good condition.
    - If a cathead is used, it should be clean and free of burrs. The cathead rope should be in good condition and not be frayed or have excessive wear.
    - Back-up alarms should be functional.
    - Vehicles should have all lug nuts and they should all be tight.

16.18.3 Work Practices

- All personnel working around drilling operations should wear appropriate PPE including a hard hat, safety glasses, and hard-toed work boots.
- Drill crews should wear work gloves.
- On hazardous waste sites, additional PPE such as respirators, protective clothing, gloves, etc. may also be required.
- In areas where there is vehicular traffic, personnel should also wear high-visibility vests or clothing.
- Maintain an organized work area free from tripping hazards.
- Drill rods or other equipment should not be stored leaning up against equipment.
- Drill holes should be completed or secured before leaving the site for the day. Drill holes should not be left open at an unattended site.
- Boring locations should be placed to minimize the possibility of contacting underground utilities or structures. Clearance should be obtained from the site project manager before drilling begins.
- Do not move the rig with the mast in the upright position.
- Use a spotter when moving the rig from one location to another on the site.
- When sampling activities require working in proximity with heavy equipment or drill rigs, sampling personnel will stand clear of the equipment until sampling is required. They will notify the operator they are going to take a sample and must receive acknowledgment from the operator.
- Do not wear loose clothing such as hooded sweatshirts, parkas, or clothing with hanging drawstrings around drill rigs.
- Monitor weather conditions. Drilling operations should be terminated and the area near the drill rig evacuated during high winds and or storms with the potential for lightning strikes. The lead driller should be consulted to help assess if weather conditions are safe for drilling.
- Drill crew personnel should wear a personal fall arrest harness, connected to a secure tie-off point, when climbing the mast or working where fall exposures exceed 6 feet.
- Hearing protection should be worn during operations that produce significant noise exposures. (If you cannot hold a conversation using a normal voice with someone within 3 feet of you because of background noise, the use of personal hearing protection is recommended.)

16.19 Working Safely with Direct Hydraulic Push (Geoprobe™) Technology

These guidelines apply to the use of direct hydraulic push (Geoprobe™ or similar) technology during site investigations. In addition to the safety precautions listed below, the equipment shall be operated and maintained according to the manufacturer's instructions.

- Contract documents for subcontractors using a Geoprobe should include CDM Smith's standard contract between "Engineer & Subcontractor for Drilling Services" and "Health and Safety Protocol for Subcontractors" available on the Office of General Council's page of contract forms at http://cdmweb/legalforms/inc.htm.

- The probe rig should be equal to the task. Hiring a contractor who uses a pneumatic hammer when direct hydraulic push is more appropriate, requires unacceptable compromises on safety.

- Before using the Geoprobe or other subsurface operations, a survey should be conducted to identify any overhead or underground utilities, unexploded ordnance, tanks, pipes, or other underground structures. The local agency or organization for utility location should be contacted to identify underground utilities. In some cases, ground penetrating radar or a magnetometer may be needed to identify the location of underground obstructions.

- The work area for the Geoprobe and crew should be cleared of sticks, logs, brush, and trash. Inspect the area for any potential tripping hazards and remove them. If they cannot be removed, they should be identified with caution tape or cones.

- Before rig setup, the planned arrangement of equipment should be such that it does not present a dangerous condition. Take into account slopes of hills, mud, standing water, overhead power lines, etc.

- OSHA regulations require that any part of the rig must be at least 10 feet away from power lines under 50kV or less. For higher voltage lines, 1 foot of additional clearance is required for every additional 30,000 volts.

- The Geoprobe should be operated by one person at a time, including assembly and disassembly of probe rod and accessories. Other field personnel shall stay clear of the probe and vehicle while the probe is in operation, being assembled, or disassembled. This is to ensure the unit is not inadvertently engaged while the operator's hands, fingers, or feet are touching or near moving parts.

- Keep feet clear of the probe as it descends.

- Do not place hands on top of probe rod while the rod is under the probing machine.

- The hydraulic system should be turned off at the control panel when changing probe rods, inserting the hammer, anvil, or attaching any accessories.
- Do not exert downward pressure on the probe to lift the probe foot over 6 inches off the ground.
- Always take the carrier vehicle out of gear and set the emergency brake before starting the push unit up.
- Always extend the probe unit out from the carrier vehicle and deploy the foot to clear the vehicle roofline before folding the probe unit out.
- The operator should stand to the control side of the probe machine and stay clear of the probe foot and derrick while operating the controls.
- Do not exert downward pressure on the probe so that the carrier vehicle tires lift off the ground. Reducing the load on the carrier vehicle may allow the vehicle to shift or slide unexpectedly.
- Be aware that the carrier vehicle's catalytic converter may be hot and has the potential to be a fire hazard if the vehicle is parked over combustible material such as dry leaves, grass, etc.
- The hydraulic system should be shut down and the vehicle engine stopped before attempting to clean or service the probe.
- Use extreme caution when using the machine while parked on loose, soft, or uneven surfaces.

16.20 Hazardous Waste Site Controls

Work sites designated as hazardous waste sites must control access to the work area to only authorized personnel and conform to general work practices expected at hazardous waste site operations as required by the OSHA Standard for Hazardous Waste Operations, 29 CFR 1910.120. The following concepts should be reflected in the HSP for the project.

16.20.1 Access Control

Controlled access to hazardous waste site work areas is required to protect personnel working on the site as well as to limit the potential for transporting contaminants off site. Depending on the size of the work site, hazards and contaminants present, and complexity of the work, access control may range from verbally cautioning nonauthorized personnel to stay away from the work area, to a program including site security, signs, or formal sign-in and sign-out procedures. Details of site-specific access control procedures should be included in the site-specific HSP. Some general work practices for access control are noted below:

For small-scale site investigations that are short-term projects (i.e., days, not weeks or months), identify a work area to the work crew and keep persons not associated with the job site out of the work area. If the site is in an area where nonauthorized persons are likely to be encountered, traffic cones, caution tape, and signs identifying the area as a controlled access area may be used.

For more extensive projects where work may be done for weeks or longer, the team should deploy more extensive access controls. They should:

- Set up physical barriers and hire security personnel to prevent nonauthorized persons from entering the work site.
- Keep the number of personnel and equipment on site to the minimum required to do the project effectively and safely.
- Establish work zones within the site (Section 16.20.2).
- Establish controlled access points to be used by authorized personnel.
- Track the entry and exit of personnel through a check-in, checkout system.
- Establish a formal decontamination corridor from exclusion zones.

16.20.2 Work Zones

Field project managers working under HSPs for hazardous waste operations are required to establish work zones to prevent or reduce the spread of site contaminants to noncontaminated areas on or off site. Movement between zones should be restricted to those that need access to a specific area, and entry and exit between zones should be through designated access control points. A description of the three work-zone system for hazardous wastes is provided below.

Exclusion Zone – The exclusion zone should include any area where contamination is known or suspected. Areas of air, water, or soil that are contaminated with hazardous materials (biohazards, radioactive materials, chemicals) should be included in the exclusion zone. The zone should be well known to site workers. On smaller projects, this can be a verbal identification to site workers, such as "a 20-foot radius around the drill rig." On larger projects, or in areas that may be encountered by observers or the general public, the zone may need to be defined with caution tape, traffic cones, or in some instances, fencing and barriers. The need will be site-specific and the specific method should be identified in the site-specific HSP. Some work practices that should be followed in the exclusion zone include:

- Employees in the exclusion zone must wear the PPE designated in the site HSP for tasks executed within the zone.
- No eating, drinking, chewing gum or tobacco, smoking, application of cosmetics, including application of lip balm, sunscreen, or insect repellant is allowed in the exclusion zone.
- Sitting or kneeling in areas of high concentrations of contaminants should be avoided.
- If any PPE becomes defective, the employee should leave the work area via the designated egress area, decontaminate as needed, and replace the defective PPE before returning to work in the exclusion zone.
- Prescription drugs should not be used within the exclusion zone unless approved by CDM Smith's medical consultant. The use of illegal drugs or consumption of alcohol is prohibited.
- When leaving the exclusion zone, employees should exit via the designated access/ egress point(s) and follow decontamination procedures described in the site HSP.

Contaminant Reduction Zone – A contaminant reduction zone (CRZ) is established to provide a transition between the exclusion zone and the support zone. The CRZ is set up at the access control points of the exclusion zone and will vary in size depending on the complexity of activities that need to occur within the zone. For small site investigations, the CRZ may simply be a designated area near containers set up to collect used disposable PPE and some soap and water. For larger projects, the CRZ may include specific decontamination points and be staffed by personnel specifically designated to participate in the decontamination of personnel and equipment exiting the exclusion zone. Depending on the site contaminants, level of contamination, and decontamination procedures, personnel in the CRZ may be required to wear protective clothing, gloves, or respirators. The specific requirements will be outlined in the site HSP. The CRZ should be placed in an area that is not contaminated at the boundary of the exclusion zone.

Support Zone – The support zone is established near the entrance to the site and is far enough from the exclusion zone and CRZ that specialized protective clothing or respirators are not used. The use of normal field PPE such as hard hats, safety glasses,

and safety work boots is expected except for areas such as office trailers, break and lunch areas, or other areas designated as having no known or anticipated hazards. Operational support activities and equipment storage and maintenance areas are located in the support zone. No equipment or personnel should go from the exclusion zone to the support zone without passing through the CRZ and being decontaminated in accordance with the site HSP.

Mobile Work Zone – For those projects that involve brief periods of work in multiple locations, a specific area may be designated as the exclusion zone for the duration of the work performed in that area. The exclusion zone can be terminated (provided there are no ongoing hazards or potential exposures to contaminants) and moved to the next area of work. For example, during soil borings or well installation, the exclusion zone can be defined as, "1.5 times the mast height" of the drill rig. Once the boring has been closed, or well installed and secured, and all drill cuttings have been secured, the area can be opened up and a new exclusion zone established around the next boring location.

16.20.3 Considerations when Establishing Work Zones

Work zones should be large enough to perform tasks within the zone safely, with no exposure to hazards to personnel outside the zone, but they should also be small enough to be able to secure and control access. Some considerations in establishing work zones include:

- Physical and topographical features of the site
- Dimensions of the contaminated area
- Weather
- Physical, chemical, and toxicological characteristics of contaminants and chemicals used in the zone
- Potential for exposure to site contaminants
- Known and estimated concentrations of contaminants
- Air dispersion of contaminants
- Fire and explosion potential
- Planned operations and space needed to perform the work safely
- Surrounding areas
- Decontamination procedures
- History of job site

16.20.4 General Hazardous Waste Site Work Practices

- **Buddy System** - Work should be scheduled so that no person works unobserved within the exclusion zone at any time. Each worker within the exclusion zone should maintain visual contact with at least one other worker on the site. All site personnel should remain aware of each other and monitor each other's condition.

- **Eating, drinking, chewing gum or tobacco, and smoking** are prohibited within the contaminant reduction and exclusion zones. (**Exception for heat stress:** Squirt bottles of water, Gatorade, or other fluids may be consumed via squirt bottles in the contaminant reduction zone with the approval of the HSM. Open bottles, cups, etc. should not be permitted.)

- Sitting or kneeling should be avoided in areas of known or suspected areas of contamination.
- Hands and face should be thoroughly washed when leaving the work area.
- Defective PPE should be repaired or replaced immediately.

Sections 5, 6, 7, 9, and 11 of this manual are particularly applicable to H&S at hazardous waste sites.

16.21 Decontamination at Hazardous Waste Sites

Proper decontamination helps protect employees and prevents the contamination of uncontaminated areas. Decontamination protects all site personnel by minimizing the transfer of harmful materials into clean areas. It helps prevent mixing of incompatible chemicals and protects the community by preventing uncontrolled transportation of contaminants from the site.

16.21.1 Prevention of Contamination

To prevent contamination, crew members should:

- Follow procedures for proper dressing before entry into the exclusion zone. Proper dressing will minimize the potential for contaminants to bypass the PPE and escape decontamination.

- Protect monitoring and sampling instruments by bagging. Make openings in the bags for sample ports and sensors that must contact site materials, or cover equipment and tools with a strippable coating, which can be removed during decontamination.

- Encase any source of contaminants on the site with barriers (e.g., plastic sheeting or over packs).

- Stress work practices that minimize contact with hazardous substances. Use remote sampling, handling, and container-opening techniques.

16.21.2 Decontamination Equipment Selection

In selecting decontamination equipment, consider whether the equipment must be decontaminated for reuse or can be easily disposed. Recommended equipment for decontamination includes:

- Storage tanks or appropriate treatment systems
- Drains or pumps
- Long-handled brushes
- Wash solutions appropriate for the contaminants present
- Rinse solutions appropriate for the contaminants present
- Pressurized sprayers for washing and rinsing
- Curtains, enclosures, or spray booths
- Long-handled rods and shovels
- Containers to hold contaminants and contaminated soils
- Wash and rinse buckets
- Brooms
- Containers for the storage and disposal of contaminated material

16.21.3 Decontamination Design

Decontamination facilities should be located in the CRZ, i.e., the area between the exclusion zone (the contaminated area) and the support zone (the clean area), and described in the site HSP.

- Site-specific factors that affect the decontamination facility design must be considered. Typical factors include:
  - The chemical, physical, and toxicological properties of the wastes
  - The pathogenicity of infectious wastes
  - The amount, location, and containment of contaminants
  - The potential for and location of exposure based on assigned worker duties, activities, and functions
  - The potential for wastes to permeate, degrade, or penetrate materials used for personal protective clothing and equipment, vehicles, tools, buildings, and structures
  - The proximity of incompatible wastes
  - The movement of personnel and/or equipment among different zones
  - The emergencies that may arise
  - The methods available for protecting workers during decontamination
  - The impact of the decontamination process and compounds on worker H&S
- Decontamination Line
  - Decontamination should be an organized process by which levels of contamination are reduced.
  - The decontamination process consists of a series of steps performed in a specific sequence. For example, outer, more heavily contaminated items are decontaminated first, followed by the decontamination and removal of inner, less contaminated items.
  - Each step should be performed at separate stations to prevent cross contamination.
  - Decontamination stations should allow enough separation to prevent cross contamination and should be arranged in order of decreasing contamination.
  - Separate decontamination areas should be provided to isolate workers from different contamination zones containing incompatible wastes or decontamination processes.
  - Entry and exit points should be conspicuously marked. Preferably the entry to the CRZ from the exclusion zone should be separate from the entry to the exclusion zone from the CRZ.
  - Dress-out stations for entry to the CRZ should be separate from redressing areas for exit from the CRZ.
  - Personnel who wish to enter clean areas of the decontamination facility, such as locker rooms, must be appropriately decontaminated first.
  - Examples of decontamination lines and procedures for personnel wearing various levels of protection are provided in Exhibits 16A and B.

16.21.4 PPE for Decontamination Workers

A rule of thumb is that decontamination workers wear a level of protection one level below the level of protection worn in the exclusion zone. However, consideration should be given to the following when determining the level of protection for a given project.

- The nature of site contamination
- Degree of contamination expected on workers leaving the exclusion zone
- The results of wipe tests and onsite air monitoring

Some site-specific cases may require that decontamination personnel wear the same level of PPE as workers in the exclusion zone. Cases include:

- Workers using a steam jet may need a different type of respiratory protection than other decontamination personnel because of the high moisture content of the steam jets.

- Cleaning solutions used and wastes removed during decontamination may generate harmful vapors, requiring a different type of respiratory or clothing protection.

16.21.5 Decontamination Methods

All personnel, clothing, equipment, and samples leaving the contaminated area of a site should be decontaminated to remove any harmful chemicals, radioactive material, or infectious organisms that may have adhered to them. The extent of decontamination will vary depending on the nature of site activity, site contamination, and other factors.

- Decontamination methods available include:

  - Physical removal
  - Chemical detoxification or disinfections/sterilization
  - A combination of both physical and chemical methods

- The selected decontamination method should be reviewed for any safety and health hazards. If the selected method poses a direct health hazard, measures shall be taken to protect both the decontamination personnel and the workers to be decontaminated.

- Physical Removal

  - Physical methods using high pressure and/or heat should be used with caution.
  - Loose contaminants can be removed by using a soap and water rinse with a soft bristle brush to remove dust and vapors that cling to equipment and workers, or that are trapped in small openings, such as clothing or fabric weaving.

- Adhering contaminants can be removed by:

  - Scraping, brushing, and wiping.
  - Solidifying.
  - Freezing (using dry ice or ice water).
  - Adsorption or absorption (e.g., kitty litter or powdered lime).
  - Melting.

- Volatile liquid contaminants can be removed from PPE or equipment by evaporation followed by a water rinse. Evaporation may be expedited by the use of steam jets.

- Chemical Removal

  - Decontamination using chemicals should only be done if recommended by an industrial hygienist or other qualified professional.
  - Any chemical used in the decontamination process must be chemically compatible with the equipment or clothing being decontaminated.
  - Halogenated solvents should only be used for decontamination in extreme cases where other cleaning agents will not remove the contaminant.

- Chemical removal types include the following:

  - Surface contaminants can be dissolved in a solvent.
  - Solidification of liquid or gel contaminants can enhance their physical removal. Typical solidification processes are moisture removal using adsorbents such as grounded clay or powdered lime; and chemical reactions using polymerization chemicals and/or chemical reagents.

16.21.6 Personnel Decontamination

Different levels of personnel protection, as discussed in the PPE guidelines, may be used at any given site. The following is a description of the decontamination process for each level of protection.

- **Level D**

  - An area should be designated for the gross removal of dirt and mud from gloves and boot covers. Paper towels and buckets of rinse water can be made available for this purpose.
  - Typical decontamination steps for Level D operations are provided in Exhibit 16-B.
  - Soap and water should be used to wash hands and face before leaving the site.
  - Laundering of personal clothing should be completed as soon as possible once offsite.

- **Level C and B**

  - A decontamination line should be established.
  - Site-specific procedures should be outlined in the site HSP. The recommended procedure for this layout is listed in Exhibit 16-C.

- **Level A** - It is not anticipated CDM Smith will directly participate in Level A operations. If required, site-specific procedures will be developed in coordination with the division HSM.

16.21.7 Sampling and Monitoring Equipment Decontamination

Sampling equipment often becomes grossly contaminated. Often trowels or drum thieves (coliwassas) are dedicated to a particular site. These should be left in the exclusion zone and disposed of as contaminated waste at the end of site work. Sampling equipment such as split spoons or other equipment that is used to collect several samples must be cleaned and decontaminated between samples to prevent cross contamination. These items should be cleaned and decontaminated in accordance with the project operations or sampling

plan. Dirt and wash solutions from sampling equipment decontamination should be collected and disposed of as investigation-derived waste.

Once grossly contaminated, testing and monitoring instrumentation can be difficult to decontaminate without causing damage to the instrument. Care should be taken in the field to prevent gross contamination of field instruments by avoiding direct contact between the instrument and contaminated soils, water, or surfaces. In some cases it may be necessary to place instruments in plastic bags, leaving small openings for sampling ports, detectors, and exhaust ports. The plastic bags can then be removed as the instrument comes out of the exclusion zone. The outside of instruments can be wiped down with paper towels or brushed off with clean soft brushes.

16.21.8 Heavy Equipment Decontamination

Drill rigs, trucks, backhoes, and other heavy equipment can be difficult to decontaminate. The method generally used is to wash them with water under pressure and scrub accessible areas with soap and warm water. Hot water and steam systems can be effective but may increase air concentrations of contaminants, exposing decontamination workers. Particular care should be taken where equipment comes into direct contact with contaminated soils such as tires, buckets, or treads. In severe cases, tires may need to be replaced or parts sand blasted clean or disposed of. Equipment should be visually inspected to be sure it is free of any visible signs of contamination. In some cases, wipe tests or other methods may be needed to confirm equipment has been adequately decontaminated before leaving the site.

16.21.9 Decontamination Solutions, Disposable PPE, and Site Wastes

Potentially contaminated equipment, disposable PPE, respirator cartridges, disposable sampling equipment, brushes, buckets, waste decontamination solutions, etc. should be secured in drums and labeled. Disposal methods for these materials may depend on client requirements and/or results of site investigation data. The confirmed presence of hazardous materials on the site may require disposal of investigation-derived wastes as hazardous wastes.

Care should be taken during work and decontamination activities to minimize waste materials generated.

Exhibit 16-B
Minimum Measures For Level D Decontamination

Station 1 - Equipment Drop	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
Station 2 - Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
Station 3 - Hard Hat, Outer Boot, and Glove Removal	Remove hard hat, outer boots, and gloves.
Station 4 - Boots, Gloves, and Outer Garment Removal	Remove boots, suit, and inner gloves and deposit in separate containers lined with plastic.
Station 5 - Field Wash	Wash hands and face.

Exhibit 16-C
Minimum Measures For Level B, And C Decontamination

Station 1 - Equipment Drop	Deposit equipment used on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather, a cool down station may be set up in this area.
Station 2 - Outer Garment, Hard Hat, Boots, and Gloves Wash and Rinse	Scrub outer boots, hard hat, outer gloves, and suit with decontamination solution or detergent/water. Rinse off using copious amounts of water.
Station 3 - Tank/Air Canister Change	If a worker leaves the exclusion zone to change an air tank, air canister, or mask, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boots donned, and joints tapped. Worker returns to duty.
Station 4 - Outer Boots, and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 5 - SCBA/Respirator Removal	SCBA backpack and facepiece/respirator is removed (avoid touching face with fingers). SCBA or respirator is deposited on plastic sheets.
Station 6 - Inner Gloves and Outer Garment Removal	Remove suit and inner gloves and deposit in separate containers lined with plastic.
Station 7 - Field Wash	Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face.

16.22 Traffic and Work Zone Safety

These guidelines apply whenever CDM Smith employees or subcontractors work in areas exposed to vehicular traffic on public streets or highways.

- Where vehicular traffic hazards exist because of work at locations near public streets or roads, a system of traffic and work zone controls should be developed to mitigate the hazard. The system should meet the requirements of Part 6 of the Manual of Uniform Traffic Control Devices (MUTCD) published by the Federal Highway Administration, or the applicable state version of the MUTCD.

- In general, when the MUTCD allows the use of traffic safety direction devices, such as cones, CDM Smith will supplement those direction devices with a physical barrier, such as a truck.

- All traffic control systems on public roads must be coordinated with local traffic control officials as required by applicable law.

- Periodically evaluate effectiveness of temporary traffic control setups by walking or riding the job area looking for evidence of poor controls and near misses such as swerving traffic, motorists braking quickly, skid marks, blind spots, etc.

- Give motorists plenty of advanced warning of upcoming work zones.

- All employees working within designated work zones or near vehicular traffic should wear high-visibility clothing such as orange, yellow, or yellow-green shirts, jackets, or vests. During wet or inclement weather, similarly colored rainwear should be worn.

- During night work, between the hours of sunset and sunrise, high-visibility clothing should incorporate reflective striping or fabric and be visible at a distance of 1,000 feet. This clothing should meet ANSI standard #107 for High Visibility Safety Apparel.

- All employees working near traffic and vehicles must maintain situational awareness at all times. Stay mindful that warning signs and cones inform drivers to take action but that some drivers may not pay attention, and vehicles may still enter the work zone.

16.24 Cell Phone Safety

16.24.1 Cell Phone Use and Driving

The National Highway Traffic Safety Administration (NHTSA) published a report in 2001 titled *An Investigation of the Safety Implications of Wireless Communications in Vehicles*. Based on the NHTSA report, the following guidelines should be followed when using your cell phone in a vehicle:

- Minimize the use of cell phones while driving. To the extent possible, place calls ahead of time while in the office, home, or if on the road, at a location where you can safely pull off the road.
- If you receive an incoming call, let your voice mail answer it and call the person back after you have stopped the vehicle at a safe location.
- If you must use your phone while driving, use hands-free systems and get to know the features such as auto-redial, speed dial, and voice-activated dialing.
- Engage in short conversations. If lengthy discussions are required, suspend the conversation and find a safe place to stop before continuing the discussion.
- Do not take notes while talking on the phone and driving. (This may seem silly, but was not an uncommon observation made by the authors of the NHTSA report.)

Some of the findings in the NHTSA report are summarized below:

- The use of cell phones while driving increases the risk of an accident.
- Contributing factors included distractions while dialing, being startled when the cell phone rang, and the act of engaging in conversation.
- The most significant factor was the act of conversation. The implication of this is that hands-free systems do not mitigate the biggest hazard associated with the use of cell phones while driving.
- Dialing the cell phone, while a distraction, was similar to the distraction potential of manually tuning a car radio.
- There is currently insufficient data to determine the magnitude of the problem because of the inconsistency of reporting accident causes.
- The presence of cell phones in vehicles enhances the notification of emergency services when needed.
- While cellular telephones clearly have distraction potential from many standpoints, such effects may be minimized if drivers are aware of the hazards, are judicious in their use of the technology, and if ergonomically sound cellular telephone designs are used.
- Eighty-five percent of cell phone users use their cell phones while driving.

- Many cities and states either have passed or are considering legislation to regulate cell phone use while driving.

Additional information related to cell phone H&S can be found at the following websites:

www.nhtsa.dot.gov/people/injury/research/wireless

www.nejm.org/content/2001/0344/0002/0133.asp

www.fda.gov/cdrh/ocd/mobilephone.html

16.24.2 Radio Frequency Radiation

Some of the information related to radio frequency exposure and cell phone use available from recognized peer reviewed journals and government agencies are listed below:

- Numerous studies looking at the use of hand-held cell phones and risk of brain cancer have indicated no association between the use of cell phones and risk of brain cancer. This includes the two most recent studies published in the Journal of the American Medical Association (AMA) and the New England Journal of Medicine (NEJM), which are among the most comprehensive undertaken as of January 2001.

- Some of the studies conducted have indicated there are biological effects associated with exposure to the types and levels of radio frequency radiation associated with cell phone use; however, there is no consensus that these effects are harmful to people.

- An editorial published in the NEJM referencing a study published in its January 2001 issue concluded, "This study allays fears raised by alarmist reports that the use of cellular phones causes brain tumors. Of course, we do not have the final word on this question, and results of future investigations may modify our perspective. Nevertheless, we believe that it is highly unlikely that the use of cellular telephones substantially increases the risk of brain tumors."

Based on the information currently available, there is not a significant health hazard associated with radio frequency radiation exposure related to cell phones. Suggestions for limiting radio frequency radiation exposure related to cellular telephone use have been published by the Food and Drug Administration (FDA) and are listed below:

- Limit cell phone use. Where possible, hold lengthy conversations on conventional phones and use cell phones for short conversations and for situations when conventional phones are not available.

- When using a mobile phone or a cell phone in a vehicle, connect it to an antenna located outside the vehicle.

- Use a "hands free" headset and a remote antenna with the cell phone carried at the waist.

- Use a cell phone with a low specific absorption rate (SAR) as published by the Federal Communications Commission (FCC).

The FCC has published a list of SAR values for almost all cell phone models manufactured since 2000. The SAR is a measure of the amount of radio frequency radiation absorbed under certain test conditions. This information is available at www.fcc.gov/oet/rfsafety/.

Appendix C

Appendix C

Safety Data Sheets

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**ALCONOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

Risk Phrases:
R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:
S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

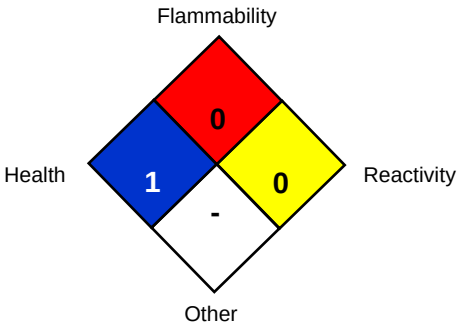
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m³	5 mg/m³	5 mg/m³
Sodium Carbonate	497-19-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

SAFETY DATA SHEET
(SDS)

This safety data sheet complies with the requirements of:
Regulation (EC) No. 1907/2006 and Regulation (EC) No. 1272/2008, (EU) No. 453/2010

Revision Date 21-May-2015 **WAI2 - EGHS - EUROPEAN** **Revision Number** 1

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product Identifier

Product Name 1413 uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
uS/cm Conductivity Solution
PPT as NaCl Pouch, 5650 uS/cm

Product Number(s) 00606-10, 35653-11, 00653-12, 00653-15, 00653-16, 00653-18, 00653-20, 35653-12, 00653-23, 00653-27, 00653-47, 35653-10, 00653-50, 35653-13, 35653-13, 35653-15

Pure substance/mixture Mixture

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Use as laboratory reagent

Uses advised against No Information available

1.3. Details of the supplier of the safety data sheet

Manufacturer/Supplier Cole-Parmer™
North America
625 East Bunker Court
Vernon Hills, IL
60061 USA
Tel: 1-800-323-4340

E-mail address info@coleparmer.com

Made in USA

1.4. Emergency telephone number 24 Hour Emergency Phone Number
CHEMTREC®
Within USA and Canada: 1-800-424-9300
Outside USA and Canada: 1-703-527-3887

(collect calls accepted)

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture
Classification - Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

This mixture is classified as not hazardous according to regulation (EC) 1272/2008 [GHS]

Classification according to EU Directives 67/548/EEC or 1999/45/EC
For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

Symbol(s)
Not dangerous goods

2.2. Label elements

Product Identifier
Signal Word
None

EUH210 - Safety data sheet available on request

P202 - Do not handle until all safety precautions have been read and understood

2.3. Other hazards
No information available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Component	Chemical Formula	EC-No.	CAS-No	Weight %	DSD Classification - 67/548/EEC	CLP Classification - Regulation (EC) No 1272/2008	REACH Reg. No
Water	No information available	EEC No. 231-791-2	7732-18-5	90 - 100%	-		No information available
Potassium Chloride	No information available	EEC No. 231-211-8	7447-40-7	0 - 10%	-		No information available

Note *The exact percentage (concentration) of composition has been withheld as a trade secret

For the full text of the R-phrases and H-Statements mentioned in this Section, see Section 16.

Full text of H- and EUH-phrases: see section 16

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General Advice Use first aid treatment according to the nature of the injury. For further assistance, contact your local Poison Control Center. Show this safety data sheet to the doctor in attendance.

Eye Contact In case of eye contact, remove contact lens and rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. If symptoms persist, call a physician.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. If symptoms persist, obtain medical attention.

Ingestion Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately.

Protection of First-aiders Use personal protective equipment. See Section 8 for more detail. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

4.2. Most important symptoms and effects, both acute and delayed

Most important symptoms/effects No information available

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable Extinguishing Media
No information available

5.2. Special hazards arising from the substance or mixture

Thermal decomposition can lead to release of irritating gases and vapors.

5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Personal Precautions Use personal protective equipment. Evacuate personnel to safe areas.

6.2. Environmental precautions

Environmental Precautions Beware of vapors accumulating to form explosive concentrations. Vapors can accumulate in low areas.

6.3. Methods and material for containment and cleaning up

Methods for Containment Prevent further leakage or spillage if safe to do so.

Methods for Cleaning Up Soak up with inert absorbent material. Pick up and transfer to properly labeled containers.

Reference to Other Sections
Refer to protective measures listed in Sections 7 and 8
See Section 8 for information on appropriate personal protective equipment
See Section 12 for additional Ecological Information
See Section 13 for additional waste treatment information

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Advice on safe handling
To avoid risks to human health and the environment, comply with the instructions for use. Wear personal protective equipment. Avoid breathing dust/fume/gas/mist/vapours/spray. Ensure adequate ventilation, especially in confined areas.

General hygiene considerations
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Conditions
Keep container tightly closed in a dry and well-ventilated place. Store at room temperature in the original container. Keep away from direct sunlight.

7.3. Specific end use(s)

Specific Use
Laboratory reagent

Risk Management Methods (RMM)
The information required is contained in this Safety Data Sheet.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Derived No Effect Level (DNEL)	No information available
Predicted No Effect Concentration (PNEC)	No information available

8.2. Exposure controls

Engineering Measures	Showers Eyewash stations Ventilation systems

Personal protective equipment

Eye/face Protection	Wear chemical splash goggles. If splashes are likely to occur, wear:. Face-shield.
Skin and body protection	Wear protective gloves/clothing.
Respiratory Protection	No protective equipment is needed under normal use conditions. In case of inadequate ventilation wear respiratory protection.

Environmental exposure controls No information available

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical State	Liquid
Appearance	Clear

Odor	None
Odor Threshold	No information available
pH Range	4.75 - 7.75

Property	**Values**	**Remarks • Method**
Melting point/freezing point	No information available	
Boiling Point/Range	~ 100 °C / 212 °F	
Flash Point (High in °C)	No information available	
Evaporation Rate	No information available	
Flammability (solid, gas)	No information available	
Flammability Limit in Air		
Upper flammability limit:	No information available	
Lower flammability limit:	No information available	
Vapor pressure	No information available	
Vapor Density	No information available	
Specific Gravity	No information available	
Water Solubility	soluble	
Solubility in other solvents	No information available	
Partition coefficient	No information available	
Autoignition Temperature		
Decomposition Temperature	No information available	
Kinematic Viscosity	No information available	
Dynamic viscosity	No information available	
Explosive Properties	No information available	
Oxidizing Properties	No information available	

9.2. Other information

Softening Point	No information available
Molecular Weight	No information available
VOC Content(%)	No information available
Density	No Information available
Bulk Density	No information available

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity
No information available

10.2. Chemical stability
Stable under normal conditions

Explosion Data

Sensitivity to Mechanical Impact	None
Sensitivity to Static Discharge	None

10.3. Possibility of hazardous reactions
None under normal processing

10.4. Conditions to avoid
Extremes of temperature and direct sunlight

10.5. Incompatible materials
No information available

10.6. Hazardous decomposition products
Thermal decomposition can lead to release of irritating gases and vapors

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute Toxicity

Product Information
Product does not present an acute toxicity hazard based on known or supplied information.

Inhalation	No information available
Eye Contact	No information available
Skin Contact	No information available
Ingestion	No information available

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	> 90 mL/kg (Rat)		
Potassium Chloride	= 2600 mg/kg (Rat)		

Skin Corrosion/Irritation	No information available
Serious eye damage/eye irritation	No information available
Sensitization	No information available
Mutagenic Effects	No information available
Carcinogenic effects	No information available
Reproductive Effects	No information available
STOT - single exposure	No information available
STOT - repeated exposure	No information available
Aspiration hazard	No information available

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Component	Freshwater Algae	Freshwater Fish	Water Flea
Potassium Chloride	2500: 72 h Desmodesmus subspicatus mg/L EC50	750 - 1020: 96 h Pimephales promelas mg/L LC50 static 1060: 96 h Lepomis macrochirus mg/L LC50 static	83: 48 h Daphnia magna mg/L EC50 Static 825: 48 h Daphnia magna mg/L EC50

12.2. Persistence and degradability
No information available

12.3. Bioaccumulative potential
No information available

12.4. Mobility in soil
No information available

12.5. Results of PBT and vPvB assessment
No information available

12.6. Other adverse effects
No information available

Endocrine Disruptor Information
No information available

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from Residues / Unused Products Disposal should be in accordance with applicable regional, national and local laws and regulations.

Contaminated Packaging Improper disposal or reuse of this container may be dangerous and illegal.

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO

14.1 UN-No Not Regulated
14.2 Proper Shipping Name Not Regulated
14.3 Hazard Class Not Regulated
Subsidiary Hazard Class Not Regulated
14.4 Packing Group Not Regulated
14.5 Marine Pollutant Not Applicable
14.6 Special Provisions None
14.7 Transport in bulk according to No information available

Annex II of MARPOL 73/78 and the IBC Code

RID

14.1 UN-No	Not Regulated
14.2 Proper Shipping Name	Not Regulated
14.3 Hazard Class	Not Regulated
14.4 Packing Group	Not Regulated
14.5 Environmental hazard	Not Applicable
14.6 Special Provisions	None

ADR

14.1 UN-No	Not Regulated
14.2 Proper Shipping Name	Not Regulated
14.3 Hazard Class	Not Regulated
14.4 Packing Group	Not Regulated
14.5 Environmental hazard	Not Applicable
14.6 Special Provisions	None

ICAO

14.1 UN-No	Not Regulated
14.2 Proper Shipping Name	Not Regulated
14.3 Hazard Class	Not Regulated
Subsidiary Hazard Class	Not Regulated
14.4 Packing Group	Not Regulated
14.5 Environmental hazard	Not Applicable
14.6 Special Provisions	None

IATA

14.1 UN-No	Not Regulated
14.2 Proper Shipping Name	Not Regulated
14.3 Hazard Class	Not Regulated
14.4 Packing Group	Not Regulated
14.5 Environmental hazard	Not Applicable
14.6 Special Provisions	None

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

European Union

Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

International Inventories

USINV	Complies
CANINV	Complies

EINECS/ELINCS	Complies
ENCS	Does not Comply
IECSC	Complies
KECL	Complies
PICCS	Complies
AICS	Complies

USINV/ TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
CANINV/ DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
ENCS - Japanese Existing and New Chemical Substances
IECSC - Chinese Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

15.2. Chemical safety assessment

A chemical safety assessment according to regulation (EC) No. 1907/2006 is not required

SECTION 16: OTHER INFORMATION

Key or legend to abbreviations and acronyms used in the safety data sheet

Full text of R-phrases referred to under sections 2 and 3
No information available

Legend - SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	*	Skin designation

Prepared By	Thermo Fisher Scientific© Water and Lab Products 22 Alpha Road Chelmsford, MA 01824, USA 1-978-232-6000
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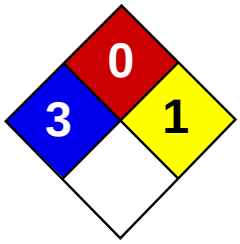
Reason for revision	Update to CLP Format

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet



Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier : Isobutylene

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

Product use : Synthetic/Analytical chemistry.

Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

SDS # : 001031

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Emergency telephone number (with hours of operation) : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Never Put cylinders into unventilated areas of passenger vehicles. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use and store only outdoors or in a well ventilated place.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Section 2. Hazards identification

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

CAS number/other identifiers

CAS number : 115-11-7

Product code : 001031

Ingredient name	%	CAS number
2-methylpropene	100	115-11-7

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Section 4. First aid measures

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Section 6. Accidental release measures

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
2-methylpropene	**ACGIH TLV (United States, 3/2012).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless.

Molecular weight : 56.12 g/mole

Molecular formula : C4-H8

Boiling/condensation point : -6.9°C (19.6°F)

Melting/freezing point : -140.7°C (-221.3°F)

Critical temperature : 144.75°C (292.6°F)

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -76.1°C (-105°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 9.6%

Section 9. Physical and chemical properties

Vapor pressure : 24.3 (psig)

Vapor density : 1.94 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.6845

Gas Density (lb/ft ^{3}) : 0.1496 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.263 g/l

Partition coefficient: n-octanol/water : 2.34

Auto-ignition temperature : 465°C (869°F)

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
2-methylpropene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Section 11. Toxicological information

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 11. Toxicological information

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
2-methylpropene	2.34	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 

Section 14. Transport information

Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 19, T50	**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 29	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 150 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act (CAA) 112 regulated flammable substances: 2-methylpropene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Section 15. Regulatory information

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
2-methylpropene	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

Canada inventory : This material is listed or exempted.

International regulations

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Chemical Weapons Convention List Schedule II Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals : Not listed

Canada

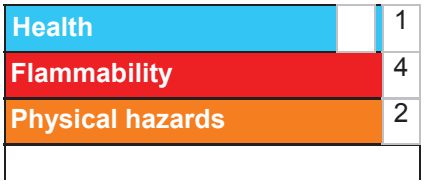
WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)



Section 16. Other information

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of printing : 10/15/2014.

Date of issue/Date of revision : 10/15/2014.

Date of previous issue : 10/6/2014.

Version : 0.02

Key to abbreviations :
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United NationsACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
CAS – Chemical Abstract Services
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
CFR – United States Code of Federal Regulations
CPR – Controlled Products Regulations
DSL – Domestic Substances List
GWP – Global Warming Potential
IARC – International Agency for Research on Cancer
ICAO – International Civil Aviation Organisation
Inh – Inhalation
LC – Lethal concentration
LD – Lethal dosage
NDSL – Non-Domestic Substances List
NIOSH – National Institute for Occupational Safety and Health

Section 16. Other information

TDG – Canadian Transportation of Dangerous Goods Act and Regulations
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
WEEL – Workplace Environmental Exposure Level
WHMIS – Canadian Workplace Hazardous Material Information System

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Version 5.12
Revision Date 08/03/2018
Print Date 09/11/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Isopropyl alcohol

Product Number : W292907
Brand : Aldrich
Index-No. : 603-117-00-0

CAS-No. : 67-63-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	2-Propanol sec-Propyl alcohol Isopropyl alcohol Isopropanol
Formula	:	C_3H_8O
Molecular weight	:	60.10 g/mol
CAS-No.	:	67-63-0
EC-No.	:	200-661-7
Index-No.	:	603-117-00-0
Registration number	:	01-2119457558-25-XXXX

Hazardous components

Component	Classification	Concentration
2-Propanol		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Dry powder Dry sand

Unsuitable extinguishing media
Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Handle and store under inert gas. hygroscopic
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
2-Propanol	67-63-0	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	400 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	400 ppm 980 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	500 ppm 1,225 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	400 ppm 980 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		PEL	400 ppm 980 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	500 ppm 1,225 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
alcohol	-	Acetone	40 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 60 min
Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Impervious clothing, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	alcohol-like
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -89.5 °C (-129.1 °F) - lit.
f)	Initial boiling point and boiling range	82 °C (180 °F) - lit.
g)	Flash point	12.0 °C (53.6 °F) - closed cup
h)	Evaporation rate	3.0
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 13.4 %(V) Lower explosion limit: 2 %(V)
k)	Vapour pressure	43.2 hPa (32.4 mmHg) at 20.0 °C (68.0 °F) 58.7 hPa (44.0 mmHg) at 25.0 °C (77.0 °F)
l)	Vapour density	No data available
m)	Relative density	0.785 g/cm3 at 25 °C (77 °F)
n)	Water solubility	soluble
o)	Partition coefficient: n-octanol/water	log Pow: 0.05 - Bioaccumulation is not expected.
p)	Auto-ignition temperature	425.0 °C (797.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available

s) Explosive properties No data available

t) Oxidizing properties No data available

9.2 Other safety information

Surface tension 20.8 mN/m at 25.0 °C (77.0 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Reacts with air to form peroxides.
Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year.
Stable under recommended storage conditions.
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Oxidizing agents, Acid anhydrides, Aluminium, Halogenated compounds, Acids

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 5,045 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex). Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - Rat - male and female - 4 h - 37.5 mg/l
(OECD Test Guideline 403)

LD50 Dermal - Rabbit - 12,800 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation
(OECD Test Guideline 405)

Respiratory or skin sensitisation
Buehler Test - Guinea pig
Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
No data available

Ames test
Salmonella typhimurium
Result: negative

In vitro mammalian cell gene mutation test
Result: negative

OECD Test Guideline 474
Mouse - male and female - Bone marrow
Result: negative

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
Inhalation, Oral - May cause drowsiness or dizziness.
Acute inhalation toxicity - Central nervous system

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: NT8050000

Central nervous system depression, prolonged or repeated exposure can cause:, Nausea, Headache, Vomiting, narcosis, Drowsiness, Overexposure may cause mild, reversible liver effects., Aspiration may lead to:, Lung oedema, Pneumonia
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Kidney - Irregularities - Based on Human Evidence
Kidney - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	flow-through test LC50 - Pimephales promelas (fathead minnow) - 9,640 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 13,299 mg/l - 48 h Remarks: (IUCLID)
Toxicity to algae	IC50 - Desmodesmus subspicatus (green algae) - > 1,000 mg/l - 72 h Remarks: (IUCLID)
Toxicity to bacteria	EC5 - Pseudomonas putida - 1,050 mg/l - 16 h Remarks: (Lit.)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 21 d Result: 95 % - Readily biodegradable.

(OECD Test Guideline 301E)

12.3 Bioaccumulative potential
No bioaccumulation is to be expected (log Pow <= 4).

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1219 Class: 3 Packing group: II
Proper shipping name: Isopropanol
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 1219 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ISOPROPANOL

IATA
UN number: 1219 Class: 3 Packing group: II
Proper shipping name: Isopropanol

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
2-Propanol	67-63-0	2007-03-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	2007-03-01

	CAS-No.	Revision Date
2-Propanol	67-63-0	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	2007-03-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
STOT SE	Specific target organ toxicity - single exposure

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.12 Revision Date: 08/03/2018 Print Date: 09/11/2018

Material Data Safety Sheet (MSDS)

PRODUCT NAME:
METHANE (0 to 2.5%), CARBON MONOXIDE (0.0005 to 1.0%), OXYGEN (0.0015 to 23.5%), BALANCE NITROGEN

1. Chemical Product and Company Identification

Instrument Depot, Inc.
115 Metro Park
Rochester, New York 14623
(800) 731-7071
(585) 424-2037
(585) 424-2042 (fax)
info@instrumentdepot.com
24-hour emergency number (800) 424-9300

Product NamE: MULTI-MIX
Chemical Name: Methane, Carbon Monoxide, Oxygen in Nitrogen
Chemical Names/Synonyms: None

TDG (Canada) Classification: 2.2

WHIMS Classification: A

2. Composition Information on Ingredients

Ingredient	% Volume	PEL-OSHA	TLV-ACGIH	LD50 or LC50
Methane FORMULA: CH_4	0 to 2.5%	Simple asphyxiate	Simple asphyxiate	n/a
Carbon Monoxide FORMULA: CO	0.0005 to 1.0%	50ppm	25ppm	1811ppm/4 hours (Rat)
Oxygen FORMULA: O_2	0.0015 to 23.5%	n/a	n/a	n/a
Nitrogen FORMULA: N_2	Balance	Simple asphyxiate	Simple asphyxiate	n/a

3. Hazards Identification

Emergency Overview: This product is a colorless odorless gas. Carbon Monoxide is a chemical asphyxiant and can produce significant adverse health effects at relatively low concentrations. Overexposure to Carbon Monoxide can cause nausea, dizziness, headaches and collapse. Additionally, releases of this product may produce oxygen-deficient atmospheres. Individuals in such atmospheres may be asphyxiated.

Route of Entry

Skin Contact	Skin Absorption	Eye Contact	Inhalation	Ingestion
No	No	No	Yes	No

Health Effects

Exposure Limits	Irritant	Sensitization	Reproductive Hazard	Mutagen
Yes	No	No	Yes	Yes

Carcinogenicity: NTP No, IARC No, OSHA No
Eye Effects: n/a
Skin Effects: n/a
Ingestion Effects: Ingestion unlikely. Gas at room temperature.

Inhalation Effects: Due to the small size of this cylinder, no unusual health effects from overexposure are anticipated under routine circumstances of use. Inhaled carbon monoxide binds with blood hemoglobin to form carboxyhemoglobin. Carboxyhemoglobin can not take part in normal oxygen transport, greatly reducing the blood's ability to transport oxygen. Depending on levels and duration of exposure, symptoms may include headache, dizziness, heart palpitations, weakness, confusion, mausea and even convulsions, eventual unconsciousness and death.

	NFPA Hazard Codes	HMIS Hazard Codes	Rating System
Health	2	2	0=No hazard 1=Slight hazard 2=Moderate hazard 3=Serious hazard 4=Severe hazard
Flammability	0	0	
Reactivity	0	0	

4. First Aid Measures

Eyes: n/a
Skin: n/a
Ingestion: Not required

Inhalation: Prompt medical attention is mandatory in all cases of overexposure. Rescue personnel should be equipped with self-contained breathing apparatus. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped, administer artificial resuscitation and supplemental oxygen. Furthe treatment should be symptomatic and supportive.

5. Fire Fighting Measures

These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be projected considerable distances, thereby hampering fire-fighting efforts.

6. Accidental Release Measures

In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

7. Handling and Storage

Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventialted areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored by exceed 130°F (54°C).

8. Exposure Controls/Personal Protection

Use adequate ventilation for extended use of gas.

9. Physical and Chemical Properties

Parameter	Value
Physical state	Gas
Evaporation point	n/a

pH	n/a
Odor and appearance	Colorless, odorless gas

10. Stability and Reactivity

Stable under normal conditions. Expected shelf life is 24 months.

11. Toxicological Information

Due to the small size of the cylinder, no toxicological damage is anticipated.

12. Ecological Information

No ecological damage caused by this product.

13. Disposal Information

Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured. Instrument Depot encourages the consumer to return cylinders.

14. Transport Information

	United States DOT	**Canada TDG**
Proper Shipping Name	Compressed Gas N.O.S.	Compressed Gas N.O.S.
	(Nitrogen, Oxygen)	(Nitrogen, Oxygen)
Hazard Class	2.2	2.2
Identification No.	UN1956	UN1956
Shipping Label	Nonflammable Gas	Nonflammable Gas

15. Regulatory Information

The components of this product are listed under the accident prevention provisions of Section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

16. Other Information

This MSDS has been prepared in accordance with the Chemicals Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of Instrument Depot and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors, we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.

MSDS/SO10/300/January 2009

Instrument Depot, Inc.
115 Metro Park
Rochester, NY 14623
800-731-7071
www.instrumentdepot.com

GASCO

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS

PRODUCT NAME: METHANE (0- 2.5%), CARBON MONOXIDE (0.0005- 1.0%), HYDROGEN SULFIDE (0.001- 0.025%, OXYGEN (0.0015- 23.5%), BALANCE NITROGEN

MSDS NO: 401 **Version:3** **Date: August, 2010**

1. Chemical Product and Company Identification

Gasco Affiliates, LLC
320 Scarlett Blvd.
Oldsmar, FL 34677

TELEPHONE NUMBER: (800) 910-0051 **24-HOUR EMERGENCY NUMBER: 1-800-424-9300**
FAX NUMBER: (866) 755-8920
E-MAIL: info@gascogas.com

PRODUCT NAME: MULTI-MIX
CHEMICAL NAME: Methane, Carbon Monoxide, Hydrogen Sulfide, Oxygen in Nitrogen
COMMON NAMES/ SYNONYMS: None
TDG (Canada) CLASSIFICATION: 2.2
WHIMIS CLASSIFICATION: A

2. COMPOSITION/ INFORMATION ON INGREDIENTS

INGREDIENT	%VOLUME	PEL-OSHA	TLV-ACGIH	LD_{50} or LC_{50} Route/Species
Methane FORMULA: CH_4	0 to 2.5%	Simple Asphixiate	Simple Asphixiate	N/A
Carbon Monoxide FORMULA: CO	0.0005 to 1.0%	50 ppm	25 ppm	1811 ppm/ 4 hours (rat)
Hydrogen Sulfide FORMULA: H_2S	0.001 to 0.025%	20 ppm	10 ppm	444 ppm (rat)
Oxygen FORMULA: O_2	0.0015 to 23.5%	N/A	N/A	N/A
Nitrogen FORMULA: N_2	Balance	Simple Asphyxiate	Simple Asphyxiate	N/A

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

This product is a colorless gas, which has a rotten-egg odor. The odor cannot be relied on as an adequate warning of the presence of this product, because olfactory fatigue occurs after over-exposure to hydrogen sulfide. Hydrogen sulfide and carbon monoxide are toxic to humans in relatively low concentrations. Over-exposure can cause skin or eye irritation, nausea, dizziness, headaches, collapse, unconsciousness, coma, and death.

PRODUCT NAME: METHANE (0- 2.5%), CARBON MONOXIDE (0.0005- 1.0%), HYDROGEN SULFIDE (0.001- 0.025%, OXYGEN (0.0015- 23.5%), BALANCE NITROGEN

ROUTE OF ENTRY:

Skin Contact	Skin Absorption	Eye Contact	Inhalation	Ingestion
Yes	No	Yes	Yes	No

HEALTH EFFECTS:

Exposure Limits	Irritant	Sensitization	Reproductive Hazard	Mutagen
Yes	Yes	No	Yes	No

Carcinogenicity: --NTP: No IARC: No OSHA: No

EYE EFFECTS:
Hydrogen sulfide can cause eyes to become scratchy, irritated and even teary. Above 50 ppm of hydrogen sulfide, there is an intense tearing blurring of vision, and pain when looking at light.

SKIN EFFECTS:
Over-exposure to carbon monoxide can be indicated by the lips and fingernails turning bright red. High concentrations of hydrogen sulfide may also be irritating to the skin.

INGESTION EFFECTS:
Ingestion unlikely. Gas at room temperature.

INHALATION EFFECTS:
Due to the small size of this cylinder, no unusual heath effects from over-exposure are anticipated under routine circumstances of use. Over-exposure to hydrogen sulfide can cause dizziness, headache, and nausea. At 12- 16% Oxygen, breathing and pulse rate is increased, muscular coordination is slightly disturbed.

NFPA HAZARD CODES		HMIS HAZARD CODES		RATING SYSTEM
Health:	4	Health:	4	0= No Hazard
Flammability:	0	Flammability:	0	1= Slight Hazard
Reactivity:	0	Reactivity:	0	2= Moderate Hazard
				3= Serious Hazard
				4= Severe Hazard

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4. FIRST AID MEASURES

EYES:
PERSONS WITH POTENTIAL EXPOSURE SHOULD NOT WEAR CONTACT LENSES. Flush contaminated eyes with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 15 minutes. Seek immediate medical attention.

SKIN:
Remove contaminated clothing as rapidly as possible. Flush affected area with copious quantities of water. Seek immediate medical attention.

INGESTION:
Not required

INHALATION:
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASED OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED THE SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

PRODUCT NAME: METHANE (0- 2.5%), CARBON MONOXIDE (0.0005- 1.0%), HYDROGEN SULFIDE (0.001- 0.025%, OXYGEN (0.0015- 23.5%), BALANCE NITROGEN

5. FIRE-FIGHTING MEASURES

These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be projected considerable distances - thereby hampering fire fighting efforts.

6. ACCIDENTAL RELEASE MEASURES

In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

7. HANDLING AND STORAGE

Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventilated areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored to exceed 130^{o}F (54^{o}C).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Use adequate ventilation for extended use of gas.

9. PHYSICAL AND CHEMICAL PROPERTIES

PARAMETER:	**VALUE:**
Physical state	: Gas
Evaporation point	: N/A
pH	: N/A
Odor and appearance	: Colorless gas with a rotten-egg odor

10. STABILITY AND REACTIVITY

Stable under normal conditions. Expected shelf life 15 months.

11. TOXICOLOGICAL INFORMATION

This gas mixture contains components that may cause embryotoxic effects in humans; however, due to the small size of the cylinder no toxicological damage is anticipated.

12. ECOLOGICAL INFORMATION

No ecological damage caused by this product.

13. DISPOSAL INFORMATION

Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured; but GASCO encourages the consumer to return cylinders.

PRODUCT NAME: METHANE (0- 2.5%), CARBON MONOXIDE (0.0005- 1.0%), HYDROGEN SULFIDE (0.001- 0.025%, OXYGEN (0.0015- 23.5%), BALANCE NITROGEN

14. TRANSPORT INFORMATION

	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Compressed Gas N.O.S. (Oxygen, Nitrogen)	Compressed Gas N.O.S. (Oxygen, Nitrogen)
HAZARD CLASS:	2.2	2.2
IDENTIFICATION NUMBER:	UN1956	UN1956
SHIPPING LABEL:	NONFLAMMABLE GAS	NONFLAMMABLE GAS

15. REGULATORY INFORMATION

The components of this product are listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds each.

TOXIC SUBSTANCE CONTROL ACT (TSCA)
All Ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

16. OTHER INFORMATION

This MSDS has been prepared in accordance with the Chemicals (Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of GASCO, and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.

MSDS/S010/401/August, 2010

CONTACT
0800 990 3258
enquiries@reagent.co.uk

ReAgent

BUFFER SOLUTION pH 4 MSDS

According to Regulation (EC) No 1907/2006

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

PRODUCT NAME	BUFFER SOLUTION pH 4
SUPPLIER	Reagent Chemical Services 18 Aston Fields Road Whitehouse Industrial Estate Runcorn Cheshire WA7 3DL T: 01928 716903 F: 01928 716425 E: info@reagent.co.uk
PRODUCT NO.	1136
APPLICATION	General chemical reagent
EMERGENCY TELEPHONE	Emergency Telephone : +44 (0) 1928 716903 Between 08.30 - 17.00

2 HAZARDS IDENTIFICATION

Not regarded as a health or environmental hazard under current legislation.

3 COMPOSITION/INFORMATION ON INGREDIENTS

4 FIRST-AID MEASURES

INHALATION

In case of severe exposure to vapours or mists remove victim from source of exposure. Provide rest, warmth and fresh air. Get medical attention if any discomfort continues.

INGESTION

Do not induce vomiting. Rinse mouth thoroughly. Get medical attention.

SKIN CONTACT

As a general precaution remove contaminated clothing and wash the skin with plenty of water. In serious cases or if discomfort continues obtain medical attention.

EYE CONTACT

Make sure to remove any contact lenses from the eyes before rinsing. Promptly wash eyes with plenty of water while lifting the eye lids. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA

The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

6 ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS

Wear protective clothing as described in Section 8 of this safety data sheet.

SPILL CLEAN UP METHODS

Small Spillages: Absorb with sand or other inert absorbent. Large Spillages: Dam and absorb spillages with sand, earth or other inert material. Collect spillage in containers, seal securely and deliver for disposal according to local regulations. Flush area clean with lots of water. Be aware of potential for surfaces to become slippery. Wash thoroughly after dealing with a spillage.

7 HANDLING AND STORAGE

USAGE PRECAUTIONS

Avoid spilling, skin and eye contact. Avoid inhalation of vapours and spray mists.

STORAGE PRECAUTIONS

Store in tightly closed original container in a dry and cool place.

BUFFER SOLUTION pH 4

STORAGE CLASS

Chemical storage.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING MEASURES

Provide adequate ventilation and appropriate extraction when vapours or mists are generated

RESPIRATORY EQUIPMENT

Wear suitable respiratory protection when vapours or mists are generated and there is inadequate ventilation or extraction.

HAND PROTECTION

Wear protective gloves. Rubber or plastic

EYE PROTECTION

Wear safety glasses. If risk of splashing, wear safety goggles or face shield.

HYGIENE MEASURES

Wash at the end of each work shift and before eating, smoking and using the toilet. Wash promptly if skin becomes wet or contaminated. Promptly remove any clothing that becomes wet or contaminated. When using do not eat, drink or smoke.

9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE	Liquid		
COLOUR	Colourless		
ODOUR	Odourless		
SOLUBILITY	Miscible with water		
BOILING POINT (°C)	About 100	RELATIVE DENSITY	About 1.0 20
pH-VALUE, CONC. SOLUTION	4		

10 STABILITY AND REACTIVITY

STABILITY

Stable under normal temperature conditions.

11 TOXICOLOGICAL INFORMATION

TOXIC DOSE 1 - LD 50 3200 (Potassium hydrogen phthalate) mg/kg (oral rat)

INHALATION

Vapours or mists in high concentration may cause irritation to the respiratory system.

INGESTION

Ingestion of large amounts may cause nausea and vomiting.

SKIN CONTACT

May cause slight irritation on prolonged contact.

EYE CONTACT

May cause temporary eye irritation.

HEALTH WARNINGS

Although not classified as hazardous, the product should be treated with the care and attention appropriate to chemicals.

12 ECOLOGICAL INFORMATION

ECOTOXICITY

Although not classified as environmentally hazardous, harmful effects cannot be excluded in the event of improper handling or disposal.

13 DISPOSAL CONSIDERATIONS

DISPOSAL METHODS

Dispose of waste and residues in accordance with local authority requirements.

14 TRANSPORT INFORMATION

GENERAL	The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).
	No transport warning sign required.
MARINE POLLUTANT	No.

15 REGULATORY INFORMATION

RISK PHRASES

NC	Not classified.

SAFETY PHRASES

NC	Not classified.

STATUTORY INSTRUMENTS

Chemicals (Hazard Information and Packaging) Regulations. Control of Substances Hazardous to Health.

APPROVED CODE OF PRACTICE

Classification and Labelling of Substances and Preparations Dangerous for Supply. COSHH essentials: Easy steps to control chemicals. Control of Substances Hazardous to Health Regulations.

GUIDANCE NOTES

Workplace Exposure Limits EH40. Introduction to Local Exhaust Ventilation HS(G)37.

NATIONAL REGULATIONS

Control of Substances Hazardous to Health Regulations 2002 (as amended)

16 OTHER INFORMATION

GENERAL INFORMATION

Under REACH Material Safety Datasheets (MSDS) are referred to as Safety Datasheets (SDS).

REVISION COMMENTS

Changes to section 6 and 7.

REVISION DATE	13/10/2008
REV. NO./REPL. SDS GENERATED	1
SDS NO.	10677

SAFETY DATA SHEET STATUS

Approved.

CONTACT
0800 990 3258
enquiries@reagent.co.uk

ReAgent

BUFFER SOLUTION pH 7 MSDS

According to Regulation (EC) No 1907/2006

1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

PRODUCT NAME	BUFFER SOLUTION pH 7
SUPPLIER	Reagent Chemical Services 18 Aston Fields Road Whitehouse Industrial Estate Runcorn Cheshire WA7 3DL T: 01928 716903 F: 01928 716425 E: info@reagent.co.uk
PRODUCT NO.	1139
APPLICATION	General chemical reagent
EMERGENCY TELEPHONE	Emergency Telephone : +44 (0) 1928 716903 Between 08.30 - 17.00

2 HAZARDS IDENTIFICATION

Not regarded as a health or environmental hazard under current legislation.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Name	EC No.	CAS-No.	Content	Classification (67/548)
SODIUM HYDROXIDE	215-185-5	1310-73-2	< 1	C;R35

The Full Text for all R-Phrases are Displayed in Section 16

4 FIRST-AID MEASURES

INHALATION

In case of severe exposure to vapours or mists remove victim from source of exposure. Provide rest, warmth and fresh air. Get medical attention if any discomfort continues.

INGESTION

Do not induce vomiting. Rinse mouth thoroughly. If casualty has ingested large amounts or if discomfort continues wash mouth thoroughly and obtain medical attention.

SKIN CONTACT

Remove contaminated clothing. Wash skin with soap and water. Get medical attention if any discomfort continues.

EYE CONTACT

Promptly wash eyes with plenty of water or eye wash solution while lifting the eyelids.If possible remove any contact lenses and continue to wash. Get medical attention if any discomfort continues.

5 FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA

The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

SPECIFIC HAZARDS

In case of fire there is a slight possibility of toxic and corrosive vapours being formed.

6 ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS

Wear protective clothing as described in Section 8 of this safety data sheet.

SPILL CLEAN UP METHODS

Small Spillages: Absorb with sand or other inert absorbent. Large Spillages: Dam and absorb spillages with sand, earth or other inert material. Collect spillage in containers, seal securely and deliver for disposal according to local regulations. Flush area clean with lots of water. Be aware of potential for surfaces to become slippery. Wash thoroughly after dealing with a spillage.

7 HANDLING AND STORAGE

BUFFER SOLUTION pH 7

USAGE PRECAUTIONS

Avoid spilling, skin and eye contact. Avoid inhalation of vapours and spray mists.

STORAGE PRECAUTIONS

Store in tightly closed original container in a dry and cool place.

STORAGE CLASS

Chemical storage.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	Std	TWA - 8 hrs		STEL - 15 min		Notes
SODIUM HYDROXIDE	OES				2 mg/m3	

ENGINEERING MEASURES

Provide adequate ventilation and appropriate extraction to avoid occupational exposure. If vapours or mists are generated, work in a fume cupboard.

RESPIRATORY EQUIPMENT

Wear suitable respiratory protection if vapours or mists are generated.

HAND PROTECTION

Wear protective gloves. Rubber or plastic

EYE PROTECTION

Wear safety glasses. If risk of splashing, wear safety goggles or face shield.

HYGIENE MEASURES

Wash at the end of each work shift and before eating, smoking and using the toilet. Wash promptly if skin becomes wet or contaminated. Promptly remove any clothing that becomes wet or contaminated. When using do not eat, drink or smoke.

9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE	Liquid		
COLOUR	Colourless		
ODOUR	Odourless		
SOLUBILITY	Miscible with water		
BOILING POINT (°C)	About 100	RELATIVE DENSITY	About 1.0 20
pH-VALUE, CONC. SOLUTION	7		

10 STABILITY AND REACTIVITY

STABILITY

Stable under normal temperature conditions.

11 TOXICOLOGICAL INFORMATION

INHALATION

Vapours or mists in high concentration may cause irritation to the respiratory system.

INGESTION

Ingestion of large amounts may cause nausea and vomiting.

SKIN CONTACT

May cause slight irritation on prolonged contact.

EYE CONTACT

Irritating to eyes.

HEALTH WARNINGS

Although not classified as hazardous, the product should be treated with the care and attention appropriate to chemicals.

12 ECOLOGICAL INFORMATION

ECOTOXICITY

Although not classified as environmentally hazardous, harmful effects cannot be excluded in the event of improper handling or disposal.

13 DISPOSAL CONSIDERATIONS

DISPOSAL METHODS

Dispose of waste and residues in accordance with local authority requirements.

BUFFER SOLUTION pH 7

14 TRANSPORT INFORMATION

GENERAL	The product is not covered by international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID).
	No transport warning sign required.
MARINE POLLUTANT	No.

15 REGULATORY INFORMATION

RISK PHRASES

NC	Not classified.

SAFETY PHRASES

NC	Not classified.

STATUTORY INSTRUMENTS

Chemicals (Hazard Information and Packaging) Regulations. Control of Substances Hazardous to Health.

APPROVED CODE OF PRACTICE

Classification and Labelling of Substances and Preparations Dangerous for Supply. COSHH essentials: Easy steps to control chemicals. Control of Substances Hazardous to Health Regulations.

GUIDANCE NOTES

Workplace Exposure Limits EH40. Introduction to Local Exhaust Ventilation HS(G)37.

NATIONAL REGULATIONS

Control of Substances Hazardous to Health Regulations 2002 (as amended)

16 OTHER INFORMATION

GENERAL INFORMATION

Under REACH Material Safety Datasheets (MSDS) are referred to as Safety Datasheets (SDS).

REVISION COMMENTS

Change to section 1

REVISION DATE	13/10/2008
REV. NO./REPL. SDS GENERATED	1
SDS NO.	10679

SAFETY DATA SHEET STATUS

Approved.

RISK PHRASES IN FULL

R35	Causes severe burns.

Atlas Scientific™
Environmental Robotics

Material Safety Data Sheet

pH 10.00 Calibration Solution

Section 1: Product and Company Identification

pH 10.00 Calibration Solution
Synonyms/General Names: pH 10.00 Buffer solution
Product Use: For device calibration
Manufacturer: Atlas-Scientific

24 Hour Emergency Information Telephone Numbers
CHEMTREC (USA): 800.424.9300 CANUTEC (Canada): 613.424.6666
Atlas-Scientific • 646.312.7741 • Atlas-Scientific.com

Section 2: Hazards Identification

HMIS (0 to 4)

Health	0
Fire Hazard	0
Reactivity	0

Blue liquid; no odor.
CAUTION! Body tissue irritant.
Target organs: None known

This material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200) if used properly.

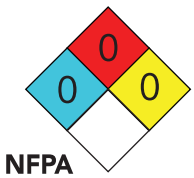
Section 3: Composition / Information on Ingredients

Sodium Tetraborate: 4.77g, 0.32-0.51%
Sodium Hydroxide: 183mL, <1%
Water: (7732-18-5), 99.1%

Section 4: First Aid Measures

Always seek professional medical attention after first aid measures are provided.
Eyes: Immediately flush eyes with excess water for 15 minutes, lifting lower and upper eyelids occasionally.
Skin: Immediately flush skin with excess water for 15 minutes while removing contaminated clothing.
Ingestion: Call Poison Control immediately. Rinse mouth with cold water. Give victim 1-2 cups of water or milk to drink. Induce vomiting immediately.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration.

Section 5: Fire Fighting Measures



Noncombustible solution. When heated to decomposition, emits acrid fumes.
Protective equipment and precautions for firefighters: Use foam or dry chemical to extinguish fire. Firefighters should wear full fire fighting turn-out gear and respiratory protection (SCBA). Cool container with water spray. Material is not sensitive to mechanical impact or static discharge.

Section 6: Accidental Release Measures

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Contain spill with sand or absorbent material and place in sealed bag or container for disposal. Ventilate and wash spill area after pickup is complete. See Section 13 for disposal information.

Section 7: Handling and Storage

Handling: Use with adequate ventilation and do not breathe dust or vapor. Avoid contact with skins, eyes, or clothing. Wash hands thoroughly after handling.
Storage: Store in General Storage Area with other items with no specific storage hazards. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.

Section 8: Exposure Controls / Personal Protection

Use ventilation to keep airborne concentrations below exposure limits. Have approved eyewash facility, safety shower, and fire extinguishers readily available. Wear chemical splash goggles and chemical resistant clothing such as gloves and aprons. Wash hands thoroughly after handling material and before eating or drinking. Use NIOSH-approved respirator with an dust cartridge. Exposure guidelines: Sodium hydroxide: OSHA PEL: Not Available, ACGIH: TLV: Not Available, STEL: Not Available.

Section 9: Physical and Chemical Properties

Molecular formula:	N/A	**Appearance:**	Blue liquid
Molecular weight:	N/A	**Odor:**	No odor
Specific Gravity:	N/A	**Odor Threshold:**	N/A
Vapor Density (air=1):	0.7 (water)	**Solubility:**	Complete
Melting Point Freezes:	@ ~0 °C	**Evaporation rate:**	N/A (Butyl acetate = 1)
Boiling Point/Range:	~100°C	**Partition Coefficient:**	N/A (log POW)
Vapor Pressure (20°C):	N/A	**pH:**	10.0, basic
Flash Point:	N/A	**LEL:**	N/A
Autoignition Temp:	N/A	**UEL:**	N/A

N/A = Not available or applicable

Section 10: Stability and Reactivity

Avoid heat and moisture.
Stability: Stable under normal conditions of use and storage.
Incompatibility: Acids, alkalis,
Shelf life: Indefinite if stored properly.

Section 11: Toxicology Information

Acute Symptoms/Signs of exposure: Eyes: Redness, tearing, itching, burning, conjunctivitis. Skin: Redness, itching.
Ingestion: Irritation and burning sensations of mouth and throat, nausea, vomiting and abdominal pain.
Inhalation: Irritation of mucous membranes, coughing, wheezing, shortness of breath,
Chronic Effects: No information found.
Sensitization: none expected
Sodium hydroxide: LD50 [oral, rat]; LC50 [rat]; N/A; LD50 Dermal [rabbit]; N/A
Material has not been found to be a carcinogen nor produce genetic, reproductive, or developmental effects.

Section 12: Ecological Information

Ecotoxicity (aquatic and terrestrial): Not considered an environmental hazard.

Section 13: Disposal Considerations

Check with all applicable local, regional, and national laws and regulations. Local regulations may be more stringent than regional or national regulations. Small amounts of this material may be suitable for sanitary sewer or trash disposal.

Section 14: Transport Information

DOT Shipping Name: Not regulated by DOT
DOT Hazard Class:
Identification Number:

Canada TDG: Not regulated by TDG
Hazard Class:
UN Number:

Section 15: Regulatory Information

EINECS: Not listed
TSCA: All components are listed or are exempt

WHMIS Canada: Not WHMIS Controlled
California Proposition 65: Not listed

The product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Section 16: Other Information

Current Issue Date: Janurary 2011

Disclaimer: *Atlas-Scientific believes that the information herein is factual but is not intended to be all inclusive. The information relates only to the specific material designated and does not relate to its use in combination with other materials or its use as to any particular process. Because safety standards and regulations are subject to change and because Atlas-Scientific has no continuing control over the material, those handling, storing or using the material should satisfy themselves that they have current information regarding the particular way the material is handled, stored or used and that the same is done in accordance with federal, state and local law. Atlas-Scientific makes no warranty, expressed or implied, including (without limitation) warranties with respect to the completeness or continuing accuracy of the information contained herein or with respect to fitness for any particular use.*

Turbidity Standard (Formazin), 4000 NTU

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 10/07/2014 Revision date: 03/09/2018 Supersedes: 10/07/2014 Version: 1.1

SECTION 1: Identification

1.1. Identification

Product form : Mixtures

Product name : Turbidity Standard (Formazin), 4000 NTU

Product code : LC26290

1.2. Recommended use and restrictions on use

Use of the substance/mixture : For laboratory and manufacturing use only.

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin sensitization, Category 1	H317	May cause an allergic skin reaction
Carcinogenicity Category 1B	H350	May cause cancer
Hazardous to the aquatic environment - Acute Hazard Category 3	H402	Harmful to aquatic life
Hazardous to the aquatic environment - Chronic Hazard Category 3	H412	Harmful to aquatic life with long lasting effects

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS07 GHS08

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H317 - May cause an allergic skin reaction
H350 - May cause cancer
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements (GHS-US) :
P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.
P261 - Avoid breathing mist, vapors, spray.
P272 - Contaminated work clothing should not be allowed out of the workplace.
P273 - Avoid release to the environment.
P280 - Wear protective gloves, eye protection.
P302+P352 - IF ON SKIN: Wash with plenty of soap and water.
P308+P313 - IF exposed or concerned: Get medical advice/attention.
P333+P313 - If skin irritation or rash occurs: Get medical advice/attention.
P362+P364 - Take off contaminated clothing and wash it before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards which do not result in classification

Other hazards not contributing to the : None under normal conditions.

classification

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	GHS-US classification
Water	(CAS-No.) 7732-18-5	94.5	Not classified
Hexamethylenetetramine	(CAS-No.) 100-97-0	5	Flam. Sol. 2, H228 Skin Sens. 1, H317
Hydrazine Sulfate, ACS	(CAS-No.) 10034-93-2	0.5	Acute Tox. 4 (Oral), H302 Acute Tox. 3 (Dermal), H311 Acute Tox. 3 (Inhalation:dust,mist), H331 Skin Irrit. 2, H315 Eye Irrit. 2A, H319 Skin Sens. 1, H317 Carc. 1B, H350 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Full text of hazard classes and H-statements : see section 16

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation : Allow victim to breathe fresh air. Allow the victim to rest.

First-aid measures after skin contact : Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse. If skin irritation or rash occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

First-aid measures after eye contact : Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persists.

First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects : May cause cancer.

Symptoms/effects after inhalation : May cause an allergic skin reaction.

4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical

No additional information available

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment : Safety glasses. Gloves.

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection.
Emergency procedures	:	Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up	:	Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor. Avoid breathing mist, vapors, spray. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.
Hygiene measures	:	Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions	:	Keep only in the original container in a cool, well ventilated place away from : Heat sources, incompatible materials. Keep container closed when not in use.
Incompatible products	:	Strong oxidizers.
Incompatible materials	:	Sources of ignition. Direct sunlight.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Hexamethylenetetramine (100-97-0)
Not applicable

Hydrazine Sulfate, ACS (10034-93-2)
Not applicable

Water (7732-18-5)
Not applicable

8.2. Appropriate engineering controls

Appropriate engineering controls	:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation. Material should be handled in a laboratory hood whenever possible.

8.3. Individual protection measures/Personal protective equipment

Hand protection:

Wear protective gloves.

Eye protection:

Chemical goggles or safety glasses

Respiratory protection:

Wear appropriate mask

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Color	:	milky
Odor	:	None.
Odor threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	Non flammable.
Vapor pressure	:	No data available
Relative vapor density at 20 °C	:	No data available
Relative density	:	No data available
Solubility	:	No data available
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosion limits	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable under normal conditions. Refrigeration enhances stability.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Hydrogen cyanide. Carbon monoxide. Carbon dioxide. Nitrogen oxides.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure	:	Skin and eye contact
Acute toxicity	:	Not classified

Hexamethylenetetramine (100-97-0)	
LD50 oral rat	9200 mg/kg
ATE US (oral)	9200 mg/kg body weight

Hydrazine Sulfate, ACS (10034-93-2)	
LD50 oral rat	601 mg/kg
ATE US (oral)	601 mg/kg body weight
ATE US (dermal)	300 mg/kg body weight
ATE US (dust, mist)	0.5 mg/l/4h

Water (7732-18-5)	
LD50 oral rat	≥ 90000 mg/kg
ATE US (oral)	90000 mg/kg body weight

Skin corrosion/irritation : Not classified

Serious eye damage/irritation : Not classified

Respiratory or skin sensitization : May cause an allergic skin reaction.

Germ cell mutagenicity : Not classified

Carcinogenicity : May cause cancer.

Hydrazine Sulfate, ACS (10034-93-2)	
National Toxicology Program (NTP) Status	3 - Reasonably anticipated to be Human Carcinogen

Reproductive toxicity : Not classified

Specific target organ toxicity – single exposure : Not classified

Specific target organ toxicity – repeated exposure : Not classified

Aspiration hazard : Not classified

Potential Adverse human health effects and symptoms : Based on available data, the classification criteria are not met.

Symptoms/effects after inhalation : May cause an allergic skin reaction.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - water : Harmful to aquatic life. Harmful to aquatic life with long lasting effects.

Hexamethylenetetramine (100-97-0)	
LC50 fish 1	49.8 g/l
EC50 Daphnia 1	36 g/l

12.2. Persistence and degradability

Turbidity Standard (Formazin), 4000 NTU	
Persistence and degradability	May cause long-term adverse effects in the environment.

Hexamethylenetetramine (100-97-0)	
Persistence and degradability	Not established.

Hydrazine Sulfate, ACS (10034-93-2)	
Persistence and degradability	Not established.

Water (7732-18-5)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Turbidity Standard (Formazin), 4000 NTU	
Bioaccumulative potential	Not established.

Hexamethylenetetramine (100-97-0)	
Log Pow	-2.2
Bioaccumulative potential	Not established.

Hydrazine Sulfate, ACS (10034-93-2)	
Bioaccumulative potential	Not established.

Water (7732-18-5)	
Bioaccumulative potential	Not established.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to comply with local, state and federal regulations.

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Not regulated

Transportation of Dangerous Goods

Not regulated

Transport by sea

Not regulated

Air transport

Not regulated

SECTION 15: Regulatory information

15.1. US Federal regulations

Turbidity Standard (Formazin), 4000 NTU	
SARA Section 311/312 Hazard Classes	Health hazard - Respiratory or skin sensitization Health hazard - Carcinogenicity

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Hydrazine Sulfate, ACS	CAS-No. 10034-93-2	0.5%

Hexamethylenetetramine (100-97-0)	
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Fire hazard

Hydrazine Sulfate, ACS (10034-93-2)	
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Delayed (chronic) health hazard

15.2. International regulations

CANADA

Hexamethylenetetramine (100-97-0)
Listed on the Canadian DSL (Domestic Substances List)

Hydrazine Sulfate, ACS (10034-93-2)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

No additional information available

National regulations

Hydrazine Sulfate, ACS (10034-93-2)
Listed as carcinogen on NTP (National Toxicology Program)

15.3. US State regulations

This product can expose you to Hydrazine Sulfate, ACS, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Hydrazine Sulfate, ACS (10034-93-2)				
U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No significant risk level (NSRL)
Yes	No	No	No	

SECTION 16: Other information

Revision date : 03/09/2018

Other information : None.

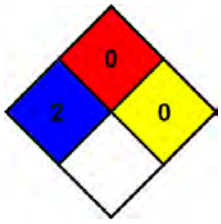
Full text of H-phrases: see section 16:

H228	Flammable solid
H302	Harmful if swallowed
H311	Toxic in contact with skin
H315	Causes skin irritation
H317	May cause an allergic skin reaction
H319	Causes serious eye irritation
H331	Toxic if inhaled
H350	May cause cancer
H400	Very toxic to aquatic life
H402	Harmful to aquatic life
H410	Very toxic to aquatic life with long lasting effects
H412	Harmful to aquatic life with long lasting effects

NFPA health hazard : 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

NFPA fire hazard : 0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 0 - Material that in themselves are normally stable, even under fire conditions.



Hazard Rating

Health : 2 Moderate Hazard - Temporary or minor injury may occur

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

Personal protection : G

G - Safety glasses, Gloves, Vapor respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

Appendix D

Appendix D

OSHA Poster

U.S. Department of Labor

OSHA®
Occupational Safety and Health Administration

Job Safety and Health
IT'S THE LAW!

All workers have the right to:

- A safe workplace.
- Raise a safety or health concern with your employer or OSHA, or report a work-related injury or illness, without being retaliated against.
- Receive information and training on job hazards, including all hazardous substances in your workplace.
- Request an OSHA inspection of your workplace if you believe there are unsafe or unhealthy conditions. OSHA will keep your name confidential. You have the right to have a representative contact OSHA on your behalf.
- Participate (or have your representative participate) in an OSHA inspection and speak in private to the inspector.
- File a complaint with OSHA within 30 days (by phone, online or by mail) if you have been retaliated against for using your rights.
- See any OSHA citations issued to your employer.
- Request copies of your medical records, tests that measure hazards in the workplace, and the workplace injury and illness log.

This poster is available free from OSHA.

Employers must:

- Provide employees a workplace free from recognized hazards. It is illegal to retaliate against an employee for using any of their rights under the law, including raising a health and safety concern with you or with OSHA, or reporting a work-related injury or illness.
- Comply with all applicable OSHA standards.
- Report to OSHA all work-related fatalities within 8 hours, and all inpatient hospitalizations, amputations and losses of an eye within 24 hours.
- Provide required training to all workers in a language and vocabulary they can understand.
- Prominently display this poster in the workplace.
- Post OSHA citations at or near the place of the alleged violations.

FREE ASSISTANCE to identify and correct hazards is available to small and medium-sized employers, without citation or penalty, through OSHA-supported consultation programs in every state.

Contact OSHA. We can help.

1-800-321-OSHA (6742) • TTY 1-877-889-5627 • www.osha.gov

OSHA 3165-04R 2015

Departamento de Trabajo de los EE. UU.

OSHA®
Administración de Seguridad y Salud Ocupacional

Seguridad y Salud en el Trabajo ¡ES LA LEY!

Todos los trabajadores tienen el derecho a:

- Un lugar de trabajo seguro.
- Decir algo a su empleador o la OSHA sobre preocupaciones de seguridad o salud, o reportar una lesión o enfermedad en el trabajo, sin sufrir represalias.
- Recibir información y entrenamiento sobre los peligros del trabajo, incluyendo sustancias toxicas en su sitio de trabajo.
- Pedirle a la OSHA inspeccionar su lugar de trabajo si usted cree que hay condiciones peligrosas o insalubres. Su información es confidencial. Algún representante suyo puede comunicarse con OSHA a su nombre.
- Participar (o su representante puede participar) en la inspección de OSHA y hablar en privado con el inspector.
- Presentar una queja con la OSHA dentro de 30 días (por teléfono, por internet, o por correo) si usted ha sufrido represalias por ejercer sus derechos.
- Ver cualquieras citaciones de la OSHA emitidas a su empleador.
- Pedir copias de sus registros médicos, pruebas que miden los peligros en el trabajo, y registros de lesiones y enfermedades relacionadas con el trabajo.

Este cartel está disponible de la OSHA para gratis.

Los empleadores deben:

- Proveer a los trabajadores un lugar de trabajo libre de peligros reconocidos. Es ilegal discriminar contra un empleado quien ha ejercido sus derechos bajo la ley, incluyendo hablando sobre preocupaciones de seguridad o salud a usted o con la OSHA, o por reportar una lesión o enfermedad relacionada con el trabajo.
- Cumplir con todas las normas aplicables de la OSHA.
- Reportar a la OSHA todas las fatalidades relacionadas con el trabajo dentro de 8 horas, y todas hospitalizaciones, amputaciones y perdidos de un ojo dentro de 24 horas.
- Proporcionar el entrenamiento requerido a todos los trabajadores en un idioma y vocabulario que pueden entender.
- Mostrar claramente este cartel en el lugar de trabajo.
- Mostrar las citaciones de la OSHA acerca del lugar de la violación alegada.

Los empleadores de tamaño pequeño y mediano pueden recibir ASISTENCIA GRATIS para identificar y corregir los peligros sin citación o multa, a través de los programas de consultación apoyados por la OSHA en cada estado.

Llame OSHA. Podemos ayudar.

1-800-321-OSHA (6742) • TTY 1-877-889-5627 • www.osha.gov/espanol

OSHA 3167-04R 2015

Appendix E

Appendix E

Injury/Illness Report Form

Injury/Illness Report Form

Effective: 1/3/2012 / Revision: 01

Information about Injured, Sick, or Involved Employee

First Name:		MI:		Last Name:	
Employee Number:		Unit:	Click to Select	Office:	
Phone Number:			Group Leader or Direct Manager		
Address:					

Employer:	☐ CDM Smith ☐ Subcontractor	Employee Status:	☐ Full Time ☐ Part Time
Name of Subcontractor Firm:		Subcontractor Phone No.	
Subcontractor Address:			

Information about Accident/Injury/Illness

Date of Accident:		Time of Accident:		Vehicle Involved?	☐ Yes ☐ No
Injury or Illness:	☐ Injury ☐ Illness	Property Damage?	☐ Yes ☐ No	Client Service Group:	Click to Select
Project and Location of Accident: (Project Name, City and State)					
Project Manager:		Witness(es):		Attach witness statement if available	

(Attach additional information if needed, i.e pictures, diagrams, etc.)

Description of Accident:(Explain what happened).

Description of Injury(Identify body part and substance or object that caused harm)

Immediate Actions Taken or Required:

Injury/Illness Report Form

Effective: 1/3/2012 / Revision: 01

Did the injured employee receive medical treatment?*	☐ Yes ☐ No	Did the employee return to work?	☐ Yes ☐ No

***Note: If the employee receives medical treatment from an offsite medical facility they must get a "work status report" from the Doctor or Medical Professional that provides treatment.**

Name of Clinic/Medical Facility	
Name of Doctor:	
Clinic/Medical Facility Address:	
Phone No.:	

Current Status of Employee:

Signatures:

Employee	X	Date:	/ /
	Type or Print Name:		
Group Leader or Direct Manager:	X	Date:	/ /
	Type or Print Name:		
H&S Manager:	X	Date:	/ /
	Type or Print Name:		

For Office Use Only:

Case No.:	OSHA Recordable? ☐ Yes ☐ No
Project No.:	Accident or Diagnosis Date:

Injury/Illness Severity, based on initial evaluation:	OSHA Illness Code:
☐First Aid Only ☐Medical Treatment ☐Lost Workdays – Restricted Activity ☐Lost Workdays – Away from Work ☐Fatality Date: _____ ☐Total Number of Lost Days: _____	☐Occupational Skin Diseases or Disorders ☐Dust Diseases of the Lungs ☐Respiratory Conditions Due to Toxic Agents ☐Poisoning ☐Disorders Due to Physical Agents ☐Disorders Associated with Repeated Trauma ☐All Other Occupational Illnesses

Additional Comments: _____

Appendix F

Appendix F

Employee Meeting Record

CDM Smith
EMPLOYEE MEETING RECORD

Date:_____ Project # or office location:_____

Time:_____ Instructor:_____

Duration of training:_____

Topics discussed:_____

Printed Name	Employee Number	Signature

Appendix G

Appendix G

Dust Control Methods

Dust Control Methods

The following are suggested dust control methods that may be used to control fugitive dust from the sources listed.

Please note: *Use of these control methods* ***DOES NOT*** *automatically assure compliance with the fugitive dust standards.* ***Use of more than one method may be necessary.***

Land clearing Activities

Control Method	Description
Watering	Application by means of trucks and/or hoses during land clearing operations.
During periods of high winds	1. Apply water as necessary, and prior to expected wind events. 2. Stop work activities temporarily.

Earthmoving Activities

Control Method	Description
Watering	1. Application of water by means of trucks, hoses, and/or sprinklers at sufficient frequency and quantity prior to conducting, during, and after earthmoving operation. 2. Pre-application of water to the depth of the proposed cuts or equipment penetration.
Wind fencing	1. Three to five-foot barriers with 50% or less porosity, adjacent to roadways or urban areas. 2. Normally used in conjunction with watering. 3. Use trees and shrubs for long-term sites.
Operate on-road haul vehicles appropriately	1. Cover entire surface of hauled material once vehicle is full. 2. Mix material with water prior to loading, and/or to entire surface of material after loading. 3. Do not overload haul vehicle. Freeboard should not be less than 3”. 4. Remove spillage from body of truck before/after loading or unloading. 5. Empty loader slowly and keep bucket close to the truck while dumping. 6. Apply water as necessary during loading operation.
During periods of high winds	1. Apply water as necessary, and prior to expected wind events. 2. Stop work activities temporarily.

Storage Piles

Control Method	Description
Watering	1. Application methods include spray bars, hoses, and water trucks. 2. Frequency of application will vary with site-specific conditions.
Wind sheltering	Install three-sided barriers, with no more than 50% porosity, equal to material height.
Altering loading and unloading procedures	1. Confine loading and unloading procedures to the downwind side of storage piles. 2. May need to be used in conjunction with wind sheltering.
Coverings	1. Tarps, plastic, or other material can be used as a temporary covering. 2. When used, coverings must be anchored to prevent wind from removing them.
During periods of high winds	1. Apply water as necessary, and prior to expected wind events. 2. Install temporary covers.

Disturbed Surface Areas or Inactive Construction Sites

Control Method	Description
Watering	Apply at sufficient frequency and quantity to develop a surface crust.
Wind fencing	1. Three to five-foot barriers with 50% or less porosity located adjacent to roadways or urban areas. 2. Normally used in conjunction with watering.
Vegetation	Establish as quickly as possible when active operations have ceased.
Prevent Access	1. Install fencing around the perimeter of property. 2. Install “No Trespassing” signs.
Site access improvements	Stay on established routes.
During periods of high winds	1. Apply water as necessary, and prior to expected wind events.

Unpaved Roads and Shoulders

Control Method	Description
Paving or chip sealing	Requires routine street sweeping if subject to material accumulation.
Watering	1. Need sufficient quantities to keep the surface moist. 2. Required application frequency will vary according to soil type, weather conditions, and amount of vehicle traffic.
Reduce speed	May need to be used with watering.
Eliminate Unnecessary travel	Restrict access or redirect traffic to reduce vehicle trips.
Gravel/Recycled Asphalt	Maintained to a size and depth effective in controlling dust.
Location	Locate haul roads as far from existing housing as possible.
Site access improvements	Stay on established routes.
During periods of high winds	1. Apply water as necessary, and prior to expected wind events. 2. Stop work and vehicle activity temporarily.

Paved Road Track-Out

Control Method	Description
Wheel washers	1. Should be placed where vehicles exit unpaved areas onto paved areas. 2. May be adjusted to spray entire vehicle including bulk-stored material in haul vehicles.
Sweep/Clean roadways	Either sweeping or water flushing may be used.
Cover haul vehicles	Entire surface should be covered with water or tarps once vehicle is fully loaded.
Site access improvements	1. Install a gravel pad or grizzly at the access point to your site. 2. Designate a single site entrance and exit. 3. Stay on established routes.
During periods of high winds	1. Cover all haul vehicles. 2. Clean streets with water flushing.